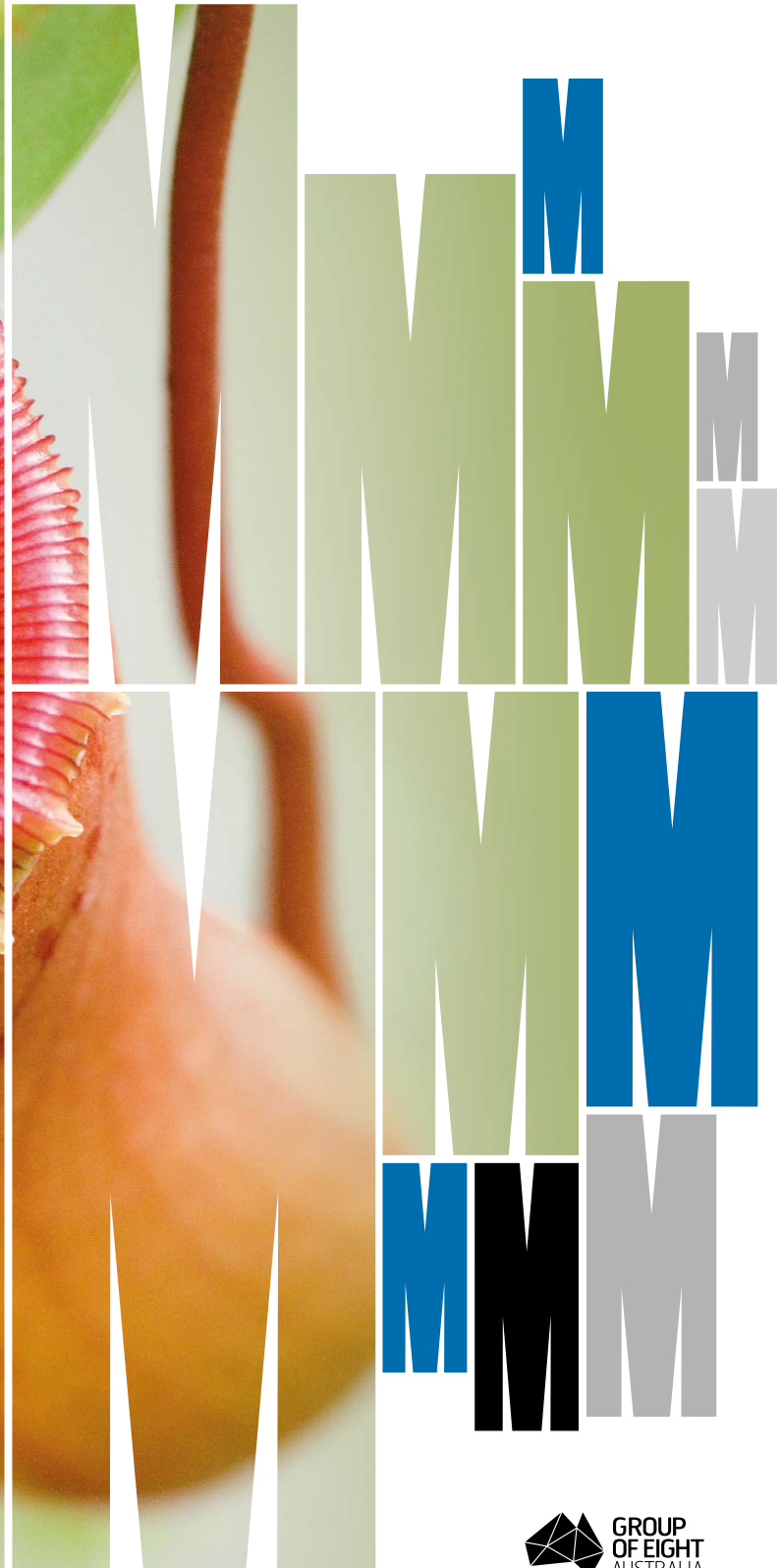


# BIOLOGICAL SCIENCES

[study.monash](http://study.monash)



# MEETING THE CHALLENGES OF A CHANGING WORLD

The climates of sub-Antarctic Islands, such as Heard Island, are changing rapidly. Photo: Steven L. Chown

# WELCOME TO THE SCHOOL OF BIOLOGICAL SCIENCES

The future of Australia, and the planet as a whole, is critically dependent on a workforce skilled in STEM (science, technology, engineering and mathematics), who are ready and emboldened to meet the grand challenges of our era.

The goal of the School of Biological Sciences is to meet these challenges, through education and research that shapes our futures.

- How can we mitigate effects of climate change on our natural and threatened ecosystems, the productivity of our agricultural systems, and the health of our population and society?
- How do we overcome the threats of current and future pandemics?
- Can we understand the genetics of diseases that currently lack effective treatments, and eventually slow down the speed at which we age?

The School of Biological Sciences is dedicated to excellence in teaching and research across all of the life sciences. We deliver an immersive education that emphasises the scientific process and trains students to push the boundaries of knowledge.

We are committed to providing our students with rich experiences, where they learn key technical and employability skills in a real-world context. This is achieved through unique opportunities to study at our international campuses, and to engage in undergraduate field training in Borneo, across Victoria, and extensively at the Jock Marshall Reserve on campus. Our undergraduate students are provided with opportunities to engage in research projects that lead to new discoveries, and to participate in internships with industry or businesses that nurture new networks and career avenues. In doing so, we prepare our graduates to address the challenges of the future.



Students studying biology at Monash choose from five different study paths, or majors. These are:

- ecology and conservation biology
- environmental science
- genetics and genomics
- plant sciences
- zoology.

Our students learn from world-leading scientists and educators in state-of-the-art learning environments. Our teaching laboratories are among the best equipped in any tertiary institution globally. They provide interactive microscopy, computing, and image analysis, which in turn enable peer-to-peer learning, real-time online integration of student discovery and instructor feedback, and life-long educational impact.

The School of Biological Sciences has a truly international set of research and educational activities. We are home to students from Australia, Asia, Europe, the Americas and elsewhere. We are committed to preparing graduates that are excellent, enterprising and inclusive, ready to engage at a global scale, and ready to tackle the challenges of our age.

On graduation our students find a wide range of careers in research, industry, business, government and non-governmental organisations. Our graduates make significant contributions to society, from policy and research excellence to leadership in the growing business of modern biology.

This brochure outlines the Monash University teaching programs in biological sciences, which are focussed in the flagship B.Sc., B.Sc. Advanced – Global Challenges (Honours), and the B.Sc. Advanced – Research Honours.

We look forward to welcoming you into the School of Biological Sciences and a prosperous future in STEM.



**CRAIG R WHITE**  
Professor and Head

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# THE CENTURY OF BIOLOGY

Biology is the study of life's processes and living organisms. 'Biological sciences' is the umbrella term given to all areas of study that have biology at their core.

Disciplines within the biological sciences focus on microbes, plants and animals, and involve the study of structure, function, evolution, development, genetics and ecology.

Scales of study range from genetics (the study of genes and the way in which they control the development of plants and animals, including humans) to ecology (the study of relationships between organisms, the biosphere and the environment).

A science for adventurous minds, the study of biology can take you back in time almost four billion years to examine the very foundations of life itself, or to the future, where you will be at the forefront of identifying and solving the growing number of biological issues confronting the planet. As a student of biological sciences you will have the opportunity to become a highly versatile graduate, with the wide variety of skills you will acquire being relevant to many careers.

A degree in biology develops the fundamental skills and knowledge to establish a career as a biologist. Research from former Australia's Chief Scientist shows that science graduates are employed in a diverse range of jobs. The School of Biological Sciences focuses on equipping students with transferable skills that can be applied in a broad range of careers.

# CAREERS IN BIOLOGY

## WHAT DO BIOLOGISTS DO?

Biology is the study of life and living systems. A biologist may examine the growth, structure, function, genetics, origin or distribution of living organisms at different scales. These scales might range from tiny life, such as bacteria, to the world's largest animals, such as whales. They may focus on understanding biological processes at the level of the cell, to levels of the whole organism, population, ecosystem or beyond.

**Biologists apply their expertise to answer some of the major questions of the future:**

- How do we conserve biodiversity in the face of ongoing environmental change caused by climate change, habitat destruction and pollution?
- How do we engineer climate resistant crops that will feed the global population of the future?
- How do we manage natural resources sustainably, for the prosperity of future generations?
- How do we improve human health, through new insights into the genetics of disease, the development of new treatments and therapies that increase the human lifespan?

## GRADUATE DESTINATIONS

**Graduates from the School of Biological Sciences have established careers in a range of biological fields, including:**

- **environmental conservation**, e.g. marine biologist or environmental consultant
- **government**, e.g. policy analyst or government advisor
- **healthcare**, e.g. genetics counsellor or technician
- **education**, e.g. teaching in schools/universities or outreach programs for museums
- **research**, e.g. biological research in universities or in a research laboratory
- **business**, e.g. innovation project consultant or strategy analyst.

**The Australia 2030 report by CSIRO (2017) identified key industry sectors that will see opportunity and growth. Many of these sectors have related biological sciences careers and include:**

- food and agriculture
- healthcare and pharmaceuticals
- manufacturing.

## WHAT OTHER CAREER SKILLS CAN THE STUDY OF BIOLOGY DEVELOP?

To thrive in the future job market, it is essential that graduates have developed transferable employability and enterprise skills.

**Transferable skills gained through biology include:**

- teamwork skills
- quantitative skills and digital literacy
- critical thinking and problem solving
- innovative and creative thinking
- communication skills for a range of audiences
- independence and self belief.



## ANASTASIA BARBARO-WAHL

Anastasia is currently studying the Bachelor of Science (Honours) after completing a Bachelor of Science/Arts with a major in genetics and a minor in microbiology.

She is investigating the role of short-chain fatty acid-sensing receptors in hypertension using mice as a model organism, which she began researching as part of the Genetics in action research unit. This subject was the highlight of her undergraduate experience, as it gave her an insight into the practical and analytical skills required to undertake postgraduate study, and provided her with opportunities to learn from experienced academics.

Anastasia's current project forms part of a wider research field examining how dietary fibre can potentially prevent the development of hypertension and cardiovascular disease in humans.

She plans to work as a research assistant on completion of her honours degree before applying to undertake a PhD.

# RESEARCH SPOTLIGHT

As a student studying biology, you will be taught by world leaders in their respective fields, and have opportunities to engage in research projects that lead to new discoveries and push forward scientific boundaries.

These opportunities range from research immersion units such as BIO3990 and GEN3990 Research in action and BIO4100 Biology research project, to paid scholarships over the summer and winter vacations. Here, we highlight some of the award-winning projects currently taking place in the School of Biological Sciences at Monash.



## DEFEATING HEART DISEASE BY MANIPULATING THE MICROBES IN OUR GUTS

High blood pressure is the main risk factor for death from cardiovascular disease. Professor Francine Marques' team is investigating the role that our gut microbes play in regulating blood pressure. The team has discovered that diets rich in fibre regulate beneficial microbes to prevent the development of heart disease and stroke. Research is ongoing to uncover the genetic mechanisms involved, and clinical trials are underway to deliver new treatments to lower blood pressure.



## MEDICATING THE ENVIRONMENT

Pharmaceuticals are major environmental pollutants, from antidepressants to contraceptive drugs, filtering through urban sewerage systems and into our natural environments. Professor Bob Wong's team studies the effects of these pollutants on the behaviour, ecology and evolution of native animals. These research discoveries are now expanding the evidence base for the global regulation of contaminants in the environment, and the treatment of wastewater effluent.





## CLIMATE PROOF CROPS OF THE FUTURE

Feeding the world remains a global challenge in the face of climate change and global population growth. Researchers in the teams of Professor Sureshkumar Balasubramanian and Dr Sridevi Sureshkumar are studying how plants sense and cope with climatic stress, unravelling the genetic and physiological mechanisms that may ultimately prove key to the development of a new generation of climate resilient crops.



## SECURING ANTARCTICA'S ENVIRONMENTAL FUTURE

Monash is home to an international research program led by Professor Steven Chown, which is forecasting environmental change across Antarctica, delivering effective protection for this last true wilderness, and securing the continent as a natural reserve devoted to peace and science.



**ARE YOU DRIVEN BY CURIOSITY? IF SO, A CAREER IN RESEARCH MAY BE FOR YOU.**



## LIFE UNDER THE SEA

The ocean covers 70 percent of the Earth, and most of the life within it remains unstudied. Researchers in the teams of Professor Dustin Marshall, Dr Keyne Monro and Professor Richard Reina study the ecology, evolution and physiology of marine organisms, and investigate the sustainability of marine ecosystems affected by climate change, with the research informing conservation and management of these ecosystems.





## CAN BIODIVERSITY EVOLVE TO COPE WITH CLIMATE CHANGE?

Our climate is rapidly changing. Research by the teams of Professor Carla Sgrò and Associate Professor Kay Hodgins seeks to understand the evolutionary capacity of populations to adapt to changes in climate; thus providing new insights into the vulnerability of our threatened animal and plant species.



## BACTERIAL WARS

Associate Professor Jeremy Barr's team is uncovering new ways to fight bacterial infections. The 21st century has seen the rise of superbugs – bacteria that are resistant to modern day antibiotics. The Barr lab is studying the use of natural viruses called bacteriophages (or phages for short) that selectively attack and kill these bacterial superbugs. They are developing techniques and methods to produce phages that will be used to treat local patients suffering antibiotic resistant bacterial infections to cure these superbugs and save lives.



# EXCELLENCE IN EDUCATION

We pride ourselves on our excellent and innovative teaching. Education in the school occurs in an environment that fosters excellence and provides the opportunity for students to learn in an engaging way from research leaders in their discipline.

We provide high quality learning environments. The school has state-of-the-art practical laboratory spaces with technology that enables you to learn in a stimulating and engaging way. Equipped to demonstrate techniques in areas such as digital microscopy, molecular biology, and data analysis, these learning spaces display a range of living and preserved plants and animals – from the smallest bacteria to the largest mammals.

Field work plays an important part of our teaching. We run study programs to the tropical forests of Borneo, as well as to the local temperate terrestrial and marine ecosystems of Victoria. On campus we have the Jock Marshall Reserve, which provides a resource where you, as a student, can carry out environmental studies in a bushland habitat. The reserve also includes a lake and sampling piers for aquatic studies.

Our approaches to teaching and learning are highly innovative and cater for different learning styles. We combine the best of face-to-face and online methods to ensure our teaching and learning emphasises hands-on experience, using approaches such as inquiry and problem-based learning, audience response systems, integrated digital laboratory manuals, live data collection in the field, peer assisted learning and engagement, and research mini projects.

Online learning systems are used in all our teaching for pre-class preparation, student collaboration, assessment, and extension activities. We also understand the importance of teaching relevant workplace skills in addition to fundamental skills, enabling biological knowledge that is required for careers or further study. Our units are consistently rated by students as among the university's best, and our staff and programs have been recognised with many national teaching awards.





# FACILITIES AND RESOURCES

As a student in the School of Biological Sciences you will be provided with excellent learning and research facilities. Access to these facilities and resources will provide you with valuable technical skills.

## TEACHING LABORATORIES IN BIOLOGICAL SCIENCES

Our teaching laboratories are among the best equipped of any tertiary institution globally. They provide interactive microscopy, computing, and image analysis, enabling peer-to-peer learning, real-time online integration of student findings and instructor feedback, and life-long educational impact.

### FIRST YEAR BIOLOGY TEACHING LABORATORY

The School of Biological Sciences' first-year biology laboratory is one of the best teaching facilities for biology in Australia. It is equipped with state-of-the-art computer facilities and multimedia resources, and is designed to enable large and small group learning.

### SECOND AND THIRD YEAR BIOLOGY AND GENETICS MULTIPURPOSE DIGITAL TEACHING LABORATORIES

Biology teaching laboratories at the School of Biological Sciences bring the full power of computing into everyday laboratory situations. State-of-the-art digital microscopy and software allow the lecturer to transmit images, spreadsheets or programs from any computer or laboratory microscope to the whole class. Students can work at their own pace while still being able to share and join in with the class activity. This fully networked system now enables us to teach the most up to date methods of analysis and computing.

## JOCK MARSHALL RESERVE

The Jock Marshall Reserve (JMR) was established in 1961 by Professor AJ 'Jock' Marshall, the foundation Chair of Zoology and Comparative Physiology. The three-hectare reserve encompasses a lake, and has been a core pillar of Monash's research and teaching activities in the natural sciences area over the past 50 years.

### The key infrastructure in the JMR includes:

- the Environmental Education Centre, with microscopes, computers and multimedia facilities
- the JMR lake, with two sampling piers and associated wetland
- remote controlled 'pan-tilt-zoom' high-definition webcams with infrared capability and ability to record wildlife active around the lake
- acoustic recorders in the lake and wetland, providing the capability to capture large amounts of data from the wildlife including birds, frogs, bats and aquatic life
- environmental monitoring platform that includes a weather station and 'real-time' monitoring of the lake's physicochemical parameters
- the JMR Website ([jockmarshallreserve.com.au](http://jockmarshallreserve.com.au)) with links to images of the JMR's fauna and flora and all of the monitoring stations.

Students undertake a wide range of projects and field investigations in the JMR. These activities include surveys of waterbirds, frogs and lizards, and the exploration of aquatic food webs and leaf-litter breakdown. The JMR also hosts science experience programs and tours of the grounds and facilities for external departments and secondary education groups, including MYSci and the John Monash Science School.

The JMR includes a natural wetland stormwater treatment area for water diverted from adjacent buildings and car parks.



My favourite aspect of my undergrad was the practical and lab work. Not only do you get the opportunity to apply your knowledge and learn lab techniques, but it's also a great opportunity to network and gain insights from your teaching assistants, lecturers and unit coordinators in a way that isn't possible in a normal lecture or tutorial."

### ANASTASIA BARBARO-WAHL

Bachelor of Science (Honours)  
Major: Genetics





# HOW TO BECOME A BIOLOGICAL SCIENTIST

Below is an overview of science-based degrees offered at Monash University and examples of degrees that may be combined with a science stream as a part of a double degree.

## SCIENCE DEGREES YOU CAN CHOOSE



### SINGLE DEGREES

#### BACHELOR OF SCIENCE

#### BACHELOR OF SCIENCE ADVANCED – RESEARCH (HONOURS)

#### BACHELOR OF SCIENCE ADVANCED – GLOBAL CHALLENGES (HONOURS)



### DOUBLE DEGREES

Faculty for second degree	Second degrees available
<b>Arts</b>	Bachelor of Arts
	Bachelor of Global Studies
	Bachelor of Music
<b>Business and Economics</b>	Bachelor of Commerce
<b>Education</b>	Bachelor of Education (Honours)
<b>Engineering</b>	Bachelor of Engineering (Honours)
<b>Information Technology</b>	Bachelor of Computer Science
	Bachelor of Information Technology
<b>Law</b>	Bachelor of Laws (Honours)
<b>Medicine, Nursing and Health Sciences</b>	Bachelor of Biomedical Science
	Bachelor of Psychology

## UNITS OFFERED BY THE SCHOOL OF BIOLOGICAL SCIENCES

BIO1011: Blueprints for life	BIO3091: Biology of Australian vegetation	GEN3040: Genomics and its applications
BIO1022: Life on Earth	BIO3020: Evolutionary ecology	GEN3051: Medical and forensic genetics
BIO1042: Life in the environment	BIO3100: Advanced methods in field ecology	GEN3062: Evolutionary and ecological genetics
BIO2010: Data science for biologists	BIO3132: Biology of Australian vertebrates	GEN3990: Genetics in action research project
BIO2011: Ecology and biodiversity	BIO3820: Tropical terrestrial biology	SCI1200: Humans, evolution and modern society
BIO2030: Food security in a changing world	BIO3990: Biology in action research project	
BIO2040: Conservation biology	BMS2042: Human genetics	
BIO2181: Evolution of plant diversity	ENV2022: Environmental field skills and monitoring	
BIO2231: Animal diversity	GEN2041: Foundations of genetics	
BIO2242: Animal structure and function	GEN2052: Genomics and population genetics	
BIO3021: Marine biology	GEN3030: Molecular, cellular and developmental genetics	
BIO3052: Animal behaviour		
BIO3082: Global change biology		



For more information on the topics studied in second and third year biology units, scan the QR code.



# WHAT TO EXPECT IN FIRST YEAR

First year biology at Monash provides students with an exceptional grounding in the knowledge and generic skills required by modern biologists and those interested in obtaining a broader based science degree.

It has been said that while the 20th century was the century of physics, the 21st century will be the century of biology. This is due to the increased demand for a sustainable and healthy environment, and through ongoing advances in the areas of genetics, medicine and ecology. This is an exciting time to be a biologist and studying biology provides you with the opportunity to be a part of these great changes.

The well-equipped first year biology laboratory, which has state-of-the-art computing facilities and multimedia resources, is designed to maximise the learning experience, in individual, small and large group settings. We provide structured courses with excellent student support from well qualified and committed tutors, teaching associates and peer tutoring programs.

We prepare students for a broad range of biological and biomedical careers through high quality programs in basic biosciences. We inspire and nurture curiosity in order to improve understanding of how our world evolved and operates. We create a flexible and innovative teaching program that provides students with the skills to learn, the motivation to want to learn, and opportunities to improve those skills that students wish and need to develop to achieve their full potential.



## PREPARATION FOR STUDYING AT TERTIARY LEVEL

First year biology at Monash does not assume prior VCE study of biology. The flexible learning structure of the subject, with considerable staff and multimedia support and extensive self-learning opportunities, means that even if you have had no experience in biology you can excel. Therefore, all students, regardless of whether they have done VCE Biology, will be challenged by the content and presentation of the course. English is a compulsory prerequisite, and VCE subjects such as biology, chemistry and mathematics are extremely useful.

First year biology is a prerequisite for many second year units and most third year units have second year prerequisites. The weekly contact hours for a student studying biological sciences units is a one-hour workshop and a three-hour practical (or equivalent) for each unit.

## TRANSITION

The first year biology staff pride themselves on the special attention they give to the transition of students from secondary to tertiary education. In understanding the complexities and difficulties confronting students as they commence a university degree, student transition and orientation is more seamless, students feel more engaged with their studies, and their learning outcomes are enhanced.

We also offer a bridging course in February for students who have not studied VCE Biology or feel that they need additional preparation.

### BLUEPRINTS FOR LIFE

#### BI01011

- What is life?
- Tiny life
- Architecture of life
- Coding life
- Living energy
- The living end

### LIFE ON EARTH

#### BI01022

- Evolving life
- Animal solutions to life
- Plant solutions to life
- Interacting life

### LIFE IN THE ENVIRONMENT

#### BI01042

- Living systems
- Ecosystems
- Environmental adaptation
- Human-induced change
- The global ecosystem

### HUMANS, EVOLUTION AND MODERN SOCIETY

#### SCH1200

- Natural selection
- Sex differences and mate choice
- Conflict and violence
- Human evolution
- Disease
- Nutrition

# CONTINUING WITH BIOLOGICAL SCIENCES



Studying biology at second and third year level at Monash builds on the knowledge and skills acquired from the first year biology program.

The school provides a range of specialised units that you will combine together to form the major required to complete your degree. In the second and third year of undergraduate study you will have an increasing focus on a chosen major and may choose most or all units in a single discipline. The majors offered in biology are ecology and conservation biology, environmental science, genetics and genomics, plant sciences, and zoology.

## DATA SCIENCE IN BIOLOGY

In their second year of studies, students pursuing majors in ecology and conservation, genetics and genomics, plant sciences or zoology must complete Data science for biologists, a unit that builds core competencies in modern data science that are not only essential for professional biologists, but are also highly valued and sought after by employers outside of science. In this unit, students learn the key principles of experimental design, and how to analyse, visualise and interpret data.

## THIRD YEAR RESEARCH PROJECT

Biology or Genetics in action research project

At a third year undergraduate level, you have the opportunity to undertake an individual research project in a discipline relating to a major area of study. This project will be conducted under the supervision of an academic staff member. Engaging in this project will build core research skills – from conceptualisation and problem solving, to laboratory or field skills, expertise in experimental design, data analysis and scientific writing. You can expect approximately six contact hours per week.

## VACATION SCHOLARSHIPS

To provide undergraduates with career and research experience, vacation research scholarships are offered each year. As a scholarship holder you will participate in a research project or pursue, under supervision, some independent work of mutual interest to you and the school. Further information and application details can be obtained from the school.

## HONOURS IN BIOLOGICAL SCIENCES

Students may enrol in a fourth year of study, which leads to an honours degree. Honours research is challenging and demands independence and initiative.

It is also exciting and rewarding, and leads to the enhanced development of academic skills and general employability skills, such as project management, critical thinking, and communication.

As an honours student, you will carry out original research on a defined project, as well as some advanced coursework. Research is undertaken in research laboratories or at field sites under the supervision of an academic staff member. Much of the research conducted by our honours students is ultimately published in world leading scientific journals, which are read by scientists and students across the globe.



# FIELDWORK



Fieldwork is a major component of our biological sciences units. As a student, conducting research and trials outside of the laboratory can enhance your appreciation of the natural world and provide valuable experience as a scientist. Below is a brief outline of the field camps and excursions that we offer to students enrolled in our majors.

## **BOTANICAL FIELDWORK AT LAKE MOUNTAIN**

Lake Mountain is a Victorian alpine area that is home to a wide variety of flora and fauna; it's the perfect landscape to explore environmental influences on vegetation, and plant adaptation. Against the beautiful backdrop of the Yarra Ranges national park, students enrolled in Biology of Australian vegetation will examine the evolutionary history of the Australian vegetation and look at the roles climate, soil, disturbance and animals play in shaping this diverse alpine environment.

## **TEMPERATE MARINE FIELDWORK IN PORT PHILLIP BAY**

To complete the practical work requirement of Marine biology, you will experience a week-long intensive field course in February. Working with staff in small project groups, you will have the opportunity to investigate various aspects of marine plant and animal biology. Habitats investigated are mainly intertidal and shallow subtidal shore environments.

## **TROPICAL TERRESTRIAL FIELDWORK IN BORNEO**

Students enrolled in Tropical terrestrial biology will travel to the heart of the jungles of Borneo, where you will explore tropical habitats in the Gunung Mulu National Park including complex and beautiful ecological systems. The 140 million-year-old Borneo rainforest is home to unique and fragile ecosystems and is one of the only remaining natural habitats for the endangered Bornean orangutan. This field trip will give hands on insight into the importance of conservation, management, climate, nutrient cycling, disturbance, and succession on tropical plants and animal ecology. Students will also carry out their own research.

## **ECOLOGICAL AND BIODIVERSITY FIELDWORK IN VICTORIA**

The school has a strong commitment to training field ecologists. Practical work in second year Ecology and biodiversity is mainly carried out during field excursions. Our ecology students conduct practical work during two day-long field trips. At Flinders, on the Mornington Peninsula, students investigate rocky intertidal shore ecology in detail. A second trip investigates forest structure and composition in the Dandenong Ranges National Park.



# MASTERS



The School of Biological Sciences oversees two separate master's programs, for students seeking to pursue advanced graduate studies.

## THE MASTER OF ENVIRONMENT AND SUSTAINABILITY

Our Master of Environment and Sustainability is a forward thinking, interdisciplinary, one to two year course that integrates the knowledge needed to mitigate and adapt to global change with sustainability principles. Central to its approach is an understanding of the scale of dependence of social, economic and environmental systems for effective environmental governance.

Graduates from the master's degree are strongly placed to provide strategic leadership in a wide range of settings, such as policy formulation, regulation, advice, management, extension and capacity building.



## THE MASTER OF GENOME ANALYTICS

Our Master of Genome Analytics will provide you with expert training in bioinformatics, genetics, and genomics, to help you future proof your career in the analysis of everything from microbiomes to cancer to infectious diseases and more.

The program's multidisciplinary structure and focus on industry and clinical application will provide you with hands-on experience to prepare you for your career. You will become workplace ready, and equipped with the knowledge and skills to help revolutionise the future of healthcare.



# MAJORS

To complete a degree at Monash University, you will need to fulfil the requirements for a major in one particular discipline.

## FIVE MAJORS TO CHOOSE

Over the following pages, we provide details of each of the five majors offered by the School of Biological Sciences, and the units required to complete each major. The course structure of each major is displayed, indicating the core units that students must complete to achieve a major, extended major or minor. Each of these units is represented by a unique code; the unit names that align to each code are provided on page 12 of this booklet.

Our majors and extended majors also have streams of complementary unit combinations for specialisations within the major. We have provided QR codes for these streams alongside each course structure table.

Further details, together with descriptions of each unit, are outlined in the Monash University Handbook.

Most biological scientists will have studied a Bachelor of Science, or a double degree, with a major in an area of biological sciences.



## ECOLOGY AND CONSERVATION BIOLOGY

## ENVIRONMENTAL SCIENCE

## GENETICS AND GENOMICS

## PLANT SCIENCES

## ZOOLOGY

## MAJORS IN THE SCHOOL OF BIOLOGICAL SCIENCES

# ECOLOGY AND CONSERVATION BIOLOGY

## WHY IS ECOLOGY AND CONSERVATION BIOLOGY SUCH AN EXCITING AREA OF SCIENCE?

Understanding patterns and processes in the natural world is essential for our survival and the planet on which we depend. Not only do we need to understand human impacts on global ecosystems, we also need to devise practical means to conserve biodiversity and ecosystem function. We are increasingly aware of human reliance on fundamental ecological systems for our health, wellbeing and prosperity. This has to be maintained in the face of rapid changes to the environment, including climate, habitat loss and degradation, biological invasion, emerging diseases and pollution.

As an ecologist, you could be involved in researching and managing Australia's ecosystems. These include the Antarctic and Southern Ocean Islands, the arid interior, tropical rainforests, diverse coastal and offshore marine areas, and the grasslands, shrublands and forests of Southern Australia. You could also become part of the global community of biologists working towards a sustainable environment for future generations. If you would like to become a scientist or manager who can operate across traditional scientific boundaries to protect, enhance and restore ecological systems, then this is the area of study for you.

## MAJOR RESEARCH AREAS IN ECOLOGY AND CONSERVATION BIOLOGY

The ecological research undertaken at Monash University was recently recognised as being amongst the world's best, as shown by the scores of five (well above world standard) for Ecology in the last three 'Excellence in Research for Australia' ERA assessments. Some examples of our current research projects are:

### HOW ARE SPECIES, COMMUNITIES AND ECOSYSTEMS RESPONDING TO RAPID ENVIRONMENTAL CHANGE?

Increasingly, human activities are changing terrestrial and marine environments. To conserve biodiversity effectively it is critical that we understand how species and ecosystems respond to these activities individually and collectively. Research and teaching in the School of Biological Sciences addresses the ways in which threats (including ocean acidification, increasing temperature and atmospheric CO<sub>2</sub>, pollution, invasive species, habitat fragmentation and degradation) affect plants, animals and other organisms. For example, will harmful algal blooms become more or less frequent with a shift in climate? How will increasing marine traffic affect sea turtles? Will crop foods become toxic under increased CO<sub>2</sub>? How hot can it get before animals can no longer function appropriately? How dry can it get before plants don't recover? How will changing climates affect the spread of invasive plants and change distribution patterns of wildfire? To conserve biodiversity we really do need to know the answers to questions like these to make sure we develop effective solutions. We carry out this work in many different environments from the icy landscapes of Antarctica to the hot, dry deserts of the Australian arid zone.

### HOW DO WE MANAGE BIODIVERSITY AND ECOSYSTEMS IN A WORLD OF CHANGE?

One of the most important reasons for having a good understanding of how species and ecosystems are responding to change is that this knowledge provides us with the information we need to conserve biodiversity. How should we best manage this change to ensure the survival of species and the sustainable use of the resources that the planet provides? We work on approaches and techniques to make sure that policy and management actions

are appropriate and effective. This includes studying how research information finds its way into the minds and actions of policy makers, and how to remove subjectivity from expert opinion. It also includes developing techniques for optimising biological monitoring with limited resources and developing robust short cuts for understanding whether and how the environment is changing.

### DO POPULATIONS OF THREATENED SPECIES HAVE THE CAPACITY TO ADAPT TO ENVIRONMENTAL CHANGE?

We explore ecophysiological and evolutionary processes to predict how our conservation approaches will affect biodiversity. We carry out field studies, experimental investigations of evolutionary processes, ecophysiological computer modelling, genetics of complex traits, and analysis of entire genomes to understand whether populations of threatened species have the capacity to adapt to changing environmental conditions. New approaches such as ecological genomics and stable isotope analysis are vitally important components of the battle to save Australia's rare, endangered and vulnerable species. We examine the mobility, fitness and evolutionary ability of populations of plants and animals using ecological, genomic and modelling approaches to understand what conditions will allow them to survive.

### HOW DO HUMAN ACTIVITIES AFFECT ANIMAL BEHAVIOUR AND HOW DO ANIMALS RESPOND?

Human activities can cause changes in the marine and terrestrial environment that disrupt the physiology, movement and behaviour of mammals, birds, lizards, sea turtles, fish, diverse invertebrates and many other species. These activities include for example heavy metal pollution, the introduction of invasive species, impenetrable fences, roads and other barriers to dispersal and habitat fragmentation.

## COURSE STRUCTURE

First year	Second year	Third year	Total Points
<b>Major</b>			
BIO1011 and one of BIO1022 or BIO1042	BIO2011, BIO2010 and BIO2040	BIO3020, BIO3100 and one of BIO3082, BIO3091, BIO3132 or GEN3062	48
12 points	18 points	18 points	
<b>Extended Major</b>			
BIO1011 and one of BIO1022 or BIO1042	BIO2011, BIO2010, BIO2040 plus BIO2181 or BIO2231 or BIO2030 or GEN3062 or BIO/GEN3990	BIO3020, BIO3100 and one of BIO3082, BIO3091, BIO3132 or GEN3062, and two other level three BIO units	72
12 points	30 points	30 points	
<b>Minor</b>			
BIO1011 and one of BIO1022 or BIO1042	Any two of BIO3020, BIO3100, BIO3082, BIO3091, BIO3132 or GEN3062		24
12 points	12 points		

### ECOLOGY AND CONSERVATION BIOLOGY ACADEMIC ADVISOR AND COORDINATOR: ASSOCIATE PROFESSOR ROHAN CLARKE

Ecology is the scientific study of interactions between plants, animals and the environment. It encompasses both the living (biotic) and non living (abiotic) components and processes that support the Earth's ecosystems. Conservation biology considers how human behaviour affects and alters species and ecosystems. It focuses on conserving biodiversity, specifically the management methods we can use to maintain or restore properly functioning ecosystems and minimise species extinctions.



## WILL WEBSTER

### BACHELOR OF SCIENCE (HONOURS)

### MAJOR: DOUBLE IN ZOOLOGY AND ECOLOGY AND CONSERVATION BIOLOGY

After completing a Bachelor of Science (Honours), Will commenced a field scientist position with EnviroDNA, which takes him to sites across Australia collecting eDNA from waterways to monitor wildlife.

For his Honours project, Will spent four months on Norfolk Island investigating a critically endangered sub species of the Morepork Owl, which at one point had declined to a population of one globally. As part of his research, he tracked and collected pellets from the bird's daytime roosts and analysed the findings to determine the species' unique diet.

Will also completed field work in the You-Yangs, Flinders and Heron Island, including a study trip to Borneo in his third year, where he collaborated with Monash Malaysia students to examine the biodiversity of insects in Mulu National Park.



Monash allowed me to develop a wide set of skills and connections that I will continue to use throughout my working life."

Ecology and conservation biology is the scientific study of interactions between organisms and their environment, and the application of that information to conservation management.



## MAJORS IN THE SCHOOL OF BIOLOGICAL SCIENCES

# ENVIRONMENTAL SCIENCE

## WHY IS ENVIRONMENTAL SCIENCE AN EXCITING AREA TO STUDY?

Environmental science is a discipline that deals with the rapidly changing environmental issues facing the world today. In this extended major you will be given both local and global perspectives on solving environmental problems. By encompassing many disciplines we give students a multidisciplinary perspective of current environmental challenges, such as climate change, freshwater, marine and land management, resource use and sustainability. Students are also given a choice of specialisation streams depending on their interests.

We believe that successfully shaping the future of our environment requires more than just passion. That is why this major offers a deep understanding of the traditional sciences, but also fosters skills in communication, problem solving and social awareness to enable the use of science in decision making.

As an Environmental Science student, you will gain professional, industry required skills, from practical fieldwork and laboratory based research methods, to experience working with policy and environmental risk assessments. Mitigating and controlling adverse environmental impacts is a global priority and a major in Environmental Science can give you the skills to make a difference.

## MAJOR RESEARCH AREAS IN ENVIRONMENTAL SCIENCES

Our environments are rapidly changing due the combined effects of climate change, habitat fragmentation and pollution.

Biologists at Monash study the effects of environmental variation on ecological processes, and develop evidence based policies for managing and protecting the environment, our ecosystems and our biodiversity in the face of human induced environmental change.

We work with decision makers to ensure that environment management decisions are based on robust scientific evidence, and we design and develop effective support tools to inform evidence based policy.

Studying environmental science allows you to specialise in a traditional area of science, while providing you with a multidisciplinary perspective and a focus on the skills necessary to tackle environmental challenges.



## COURSE STRUCTURE

First year	Second year	Third year	Total Points
<b>Extended Major</b>			
CHM1011, EAE1022 and BIO1042	ATS2548, ENV2022 plus two of: BIO2040, BIO2011, EAE2011, EAE2111, EAE2322	ATS3546, EAE3012 plus three units of: BIO3100, BIO3082, BIO3091, BIO3111, EAE3111, EAE3051, EAE3132, EAE3022, EAE3311, EAE3321, EAE3331, EAE3342, ENV3022	72
18 points	24 points	30 points	

### ENVIRONMENTAL SCIENCE ACADEMIC ADVISOR AND COORDINATOR: PROFESSOR DAMIAN DOWLING

Environmental science contributes to solving environmental challenges we face now and in the future. It draws on science to understand the interactions among physical, chemical and biological components of the environment, and creates new knowledge and ways of thinking to inform methods for managing complex environmental issues. This knowledge can also contribute to influencing policy, management and law. Environmental science is therefore suited to those interested in a career in science, as well as those who understand that a science background can lead to work in organisations not typically associated with science, but where environmental considerations are important.



## ZOE HUDSON

### BACHELOR OF SCIENCE

#### MAJOR: ZOOLOGY

Growing up passionate about animals, Zoe originally planned to pursue veterinary medicine. But after spending a year working in a clinic, she realised her true calling lay in wildlife conservation, leading her to begin a Bachelor of Science at Monash University.

This shift gave Zoe the chance to explore broader, conservation-focused ways to support animal care and research. Over the course of her degree, she has developed her keen interest in zoology, deepening her curiosity with every unit she takes.

At Monash, she's thrived in both lab and field settings, especially through the BIO3990 Biology research in action unit, where she's had the chance to apply a range of skills she's built across her studies.

Field trips and hands-on lab experiences have made the science come alive for her. Zoe's favourite experiences include an internship with the Marine Mammal Foundation, which expanded her view on the diverse career options available to Monash University's science graduates.

Looking ahead, Zoe is excited to see where her science degree will take her, confident in the range of skills and experiences she has gained. Whether in research, conservation, or a yet-to-be-discovered path, she's ready to keep learning and make a difference.



## MAJORS IN THE SCHOOL OF BIOLOGICAL SCIENCES

# GENETICS AND GENOMICS

## WHY IS GENETICS AND GENOMICS SUCH AN EXCITING AREA OF SCIENCE?

Genetics is the study of genes – their structure, function, transmission and evolution. It lies at the centre of biology because the same genetic principles apply to microbes, plants and animals including humans. Genetics is at the interface between traditional biology, with its descriptive study of the whole organism and molecular biology, with its study of the molecular workings of the cell. It also provides the basis for recombinant DNA technology, the molecular manipulations whereby genes can be added, deleted or altered in cells and organisms in order to study gene function or enhance specific genetically controlled characteristics.

As a geneticist, you may be found at the laboratory bench isolating the DNA of particular genes, in the field collecting genetic material from biological specimens, or at the computer designing models of gene interactions and interpreting information from the many genome projects that now exist. As a student of genetics and genomics you will study current areas of molecular genetic research such as the regulation of gene expression, generation of transgenic plants, animals and microbes, genome editing using cell lines and comparative and functional genomics. You will obtain a wide perspective across both disciplines and be fully equipped for careers in the burgeoning fields of biomedical science and biotechnology.

## MAJOR RESEARCH AREAS IN GENETICS AND GENOMICS

Genetics research has a long tradition at Monash, and there are many areas of research available to students undertaking honours and postgraduate research projects.

### CAN ANIMAL MODELS OF HUMAN DISEASES HELP IN THEIR TREATMENT OR PREVENTION?

The common genetic ancestry of all animals means that genes associated with human disease are usually also found in experimentally amenable systems such as the zebrafish, the fruit fly, and the mouse. By introducing disease causing mutations into the genomes of these 'model' systems, the pathogenesis of the disease can be studied in greater detail, more rapidly, at lower cost and potential treatments can be tested quickly. We are using such techniques to study degenerative muscle, nervous system disorders, cardiovascular diseases and diseases of nutrient metabolism with the aim of improving health outcomes for people affected with these conditions.

### HOW DO GENES INTERACT WITH THE ENVIRONMENT SO THAT PLANTS, ANIMALS AND MICROBES CAN ADAPT TO CHANGING CONDITIONS?

Genetic variation between the many individuals that make up plant or animal populations provides the raw material for adaptation and evolution. Such diversification may eventually lead to the formation of novel species as populations adapt separately to different environments. Similarly, genetic variation underpins the ability of organisms to adjust to environmental disturbances, such as climate change. We are studying diverse organisms to identify the genetic variation that controls complex characteristics and how this variation alters evolution and disrupts ecosystems. We want to know if there are limits to species' adaptive capabilities in a rapidly changing world. This research will allow predictions to be made about the potential impacts on native populations of altered conditions such as those envisaged under both moderate and extreme climate change scenarios, and potentially help mitigate the effects of climate change on native ecosystems.

### HOW IS THE GENETIC INFORMATION IN A SIMPLE EMBRYO INTERPRETED TO ALLOW THE GENERATION OF COMPLEX ADULT FORMS?

Plants and animals start life as a single cell that contains all the genetic information required for the generation of the diverse array of tissues such as blood, muscle, skin, heart and brain seen in a fully developed adult. In each cell type, genes are turned on and off in a unique combination that defines the cell's biochemical makeup and function. We are studying the developmental genetic switches that control processes as diverse as flower patterning in plants, formation of the nervous system in zebrafish and generation of head and tail structures in fly larvae. This fascinating area of basic biology also has potential downstream applications in agricultural productivity and human health.

### HOW DOES THE MICROBIOTA EFFECT HUMAN HEALTH AND HOW CAN WE MANIPULATE THE HUMAN MICROBIOTA?

Microbiota (i.e., bacteria, fungi and viruses that inhabit the human body) have major effects on human health. We are studying how composition of microbes in the gut can influence heart disease. We employ microbiome engineering – by introducing bacteria that promote health while targeting bacteria that cause disease. We also study viruses that target and kill bacteria known as bacteriophages with the aim of using them in a manner similar to antibiotics and contribute to efforts of 'phage therapy'. We also conduct experimental evolution studies that help to understand evolutionary processes and to evolve more useful bacteriophages.

## COURSE STRUCTURE

First year	Second year	Third year	Total Points
<b>Major</b>			
BIO1011 and BIO1022	GEN2041, GEN2052 and BIO2010	Any three units from: GEN3030, GEN3040, GEN3051, GEN3062, GEN3990	48
12 points	18 points	18 points	
<b>Extended Major</b>			
BIO1011 and BIO1022	GEN2041, GEN2052, MCB2011 and BIO2010	GEN3030, GEN3040, GEN3051, GEN3062 and one of GEN3990, or any level 3 BCH, MIC or DEV unit	72
12 points	24 points	36 points	
<b>Minor</b>			
BIO1011 and BIO1022	12 points of GEN units at level two or three		24
12 points	12 points		

### GENETICS AND GENOMICS ACADEMIC ADVISOR AND COORDINATOR: DR RICHARD BURKE

Genetics encompasses the study of genes, their structure, function, inheritance and evolution and spans a rich and diverse range of research topics. Genetics lies at the centre of biology because the genetic code provides the blueprint for life and every aspect of biology, from development, physiology and biochemistry through to behaviour and ecology, is ultimately controlled by the products of genes and their interaction with the physical environment.



## ABRAHAM FREIJAH

### BACHELOR OF SCIENCE (HONOURS)

### MAJOR: DOUBLE IN MICROBIOLOGY AND GENETICS

After completing a Bachelor of Science (Honours) with a major in Microbiology and Genetics, Abraham began working as a Medical Lab Technician at the Molecular Biology Lab at Alfred Health, where he conducts testing for Covid-19 and other viruses.

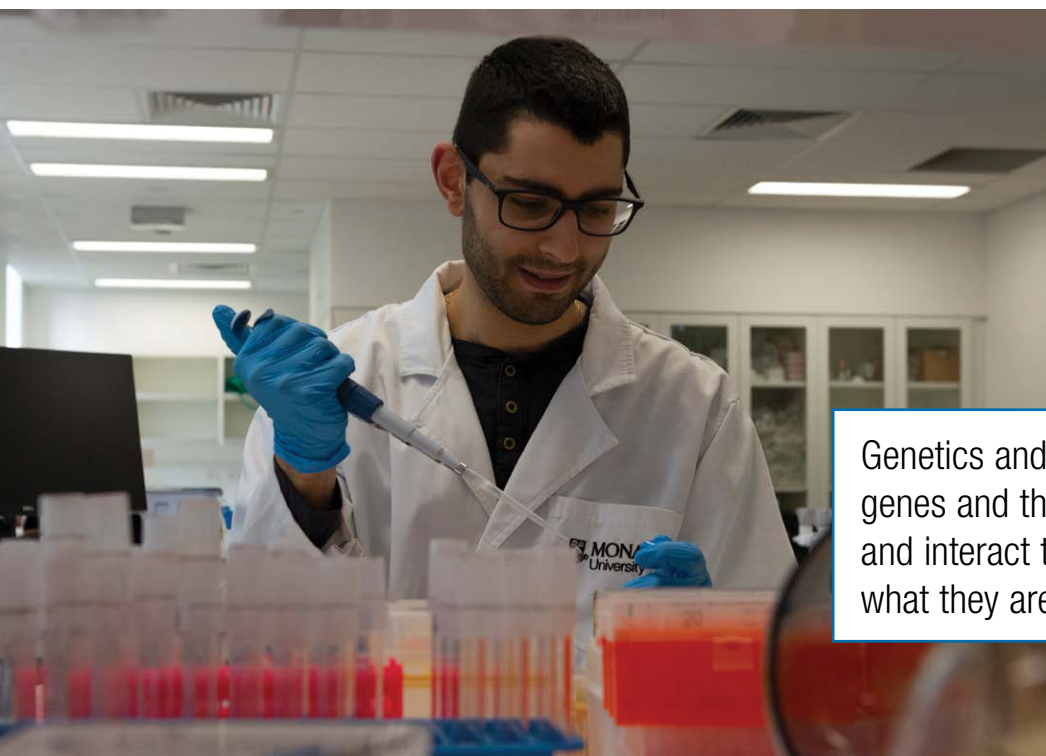
For his Honours project completed with the Monash Greening Lab, Abraham investigated the ability of tuberculosis bacteria to resist carbon monoxide, which involved bacterial gene cloning and protein purification.

His interest in microbiology was sparked after completing a practical exercise in gram staining to identify different bacteria during his first year at Monash. This led him to undertake an internship with Nufarm Limited during his third year. The development of research, communication and collaboration skills taught in tandem with practical work ensured Abraham experienced a smooth transition from study to work, as well as provided a strong network of peers.



In addition to developing skills in a lab environment, my communication, critical thinking and problem solving has come a long way since my first year."

Genetics and genomics is the study of genes and the ways in which they work and interact to make plants and animals what they are.





# MAJORS IN THE SCHOOL OF BIOLOGICAL SCIENCES

# PLANT SCIENCES

## WHY IS PLANT SCIENCES SUCH AN EXCITING AREA OF SCIENCE?

The two big challenges facing the world today are climate change and population growth. Feeding the world while preserving biodiversity is a major focus of plant science research. In the plant sciences major, you will study the diversity and function of plants and their interactions with the environment. For example, how do plants obtain their water and nutrients from the soil and how does photosynthesis use light energy to transform carbon dioxide into carbohydrates? How do bushfires affect vegetation structure? How does climate change affect food security? You can investigate these issues either at the level of the ecosystem, the whole plant, or at a cellular and genetic level.

## MAJOR RESEARCH AREAS IN PLANT SCIENCES

Monash has a strong research program in a broad range of plant sciences.

### PLANT ECOLOGY AND EVOLUTION AFFECTS NATURAL ECOSYSTEMS AND FOOD SECURITY

We study the ecology and evolution of reproduction in plants to understand how they allocate their energy resources. For example, plants need to interact with pollinators in order to produce the next generation, and this interaction with pollinators has led to the evolution of complex and beautiful floral patterns and reproductive strategies. Our work seeks to understand plants in the natural environment. This information also has strong economic and practical applications. Plant-pollinator interactions are central to maintaining agricultural crop production. The genetic forces governing the evolution of plant species also helps us to understand, predict and control invasive plants.

### PLANT RESPONSES TO GLOBAL CLIMATE CHANGE

We study the effect of climate change on plants and consequences for global food security. Rising levels of atmospheric carbon dioxide and increases in global average temperatures affect plants directly through the process of photosynthesis as well as by changing the climate. When CO<sub>2</sub> is higher, plants are more efficient, so they downsize their photosynthetic apparatus, which is mostly made of protein. Under future climate change projections, plants are therefore predicted to evolve to be less nutritious with lower concentrations of protein and micronutrients. Growing world populations, coupled with the predicted negative impacts of increasing temperatures on agricultural productivity, presents a significant challenge to global food security. We are using diverse approaches to address this challenge using a combination of cutting edge agritech, biotech and genomic approaches.

### PLANTS ARE THE BASIS OF LIFE

Plants and algae are the dominant forms of life on Earth, forming the basis of all food chains and thus underpinning all forms of life on the planet. The oxygen we breathe and the food that animals depend on all starts with plants. How do plants allocate their energy resources between reproduction and other functions like growth, stress tolerance and defence against herbivores? Understanding how plants trap energy, grow, develop and set seed is fundamental to what we do in the Plant Sciences. Plants can't run away; instead, they produce chemical and physical defences to protect themselves from herbivores. A focus of our research is on the toxins that all plants make naturally, and how this affects the animals that eat them. We are also using genetic technologies to develop non toxic varieties of crop plants that are safe for human consumption.

### CAN PLANTS CONTRIBUTE TO A SUSTAINABLE FUTURE?

Our research works towards many of the United Nations Sustainable Development Goals. We study the interactions of plants with nutrients, invertebrates and microbes in the soil. The big question is: can we manage these interactions to achieve environmental sustainability in a time of significant environmental change? We use cutting edge technologies to address the problems at different scales, from the molecular level through to the scale of whole landscapes. This scientific understanding ultimately needs to inform policy, and we believe in applying our research findings to issues of national and international significance.

Plant sciences is the scientific study of plant diversity and function and the roles that plants play in different types of ecosystems.

## COURSE STRUCTURE

First year	Second year	Third year	Total Points
<b>Major</b>			
BIO1011 and one of BIO1022 or BIO1042	BIO2181, BIO2030 and BIO2010	BIO3091 and BIO3082 and any other Level 3 BIO or GEN Units.	48
12 points	18 points	18 points	
<b>Minor</b>			
BIO1011 and one of BIO1022 or BIO1042	BIO2181 and BIO2030		24
12 points	12 points		

### PLANT SCIENCES ACADEMIC ADVISOR AND COORDINATOR: PROFESSOR SURESHKUMAR BALASUBRAMANIAN

Plant sciences is the study of plants, their diversity and structure, and how they function. It involves studying plants living on land, in the sea and in freshwater environments, from the scale of genes and molecules to ecosystems and landscapes. We study the great diversity of plant groups, from algae and mosses through to gymnosperms and angiosperms. We investigate how plants function, have evolved and are adapted to particular environments, and the distribution and diversity of plant species and the plant communities in which they grow.



## BRIDGET HUTCHISON

### BACHELOR OF SCIENCE

#### MAJOR: GENETICS AND GENOMICS

Bridget came to science after an early career in viticulture and agriculture – and hasn't looked back since.

Now studying a Bachelor of Science, with a focus on genetics and coding, Bridget says their return to study has felt like a natural next step.

Science has always been my passion. I used to collect backyard science magazines as a kid, doing every experiment I could", they recall.

At Monash, Bridget has embraced the blend of lab and field-based learning. From collecting data on Lake Mountain's diverse plant communities to exploring plant science in the lab, they've had a chance to connect practical skills with real-world ecosystems. Their current research project in GEN3990 has been a particular highlight.



It combines two of my favourite things: coding and genetics. I highly recommend it to anyone who's curious about research – it's hands-on and really rewarding.

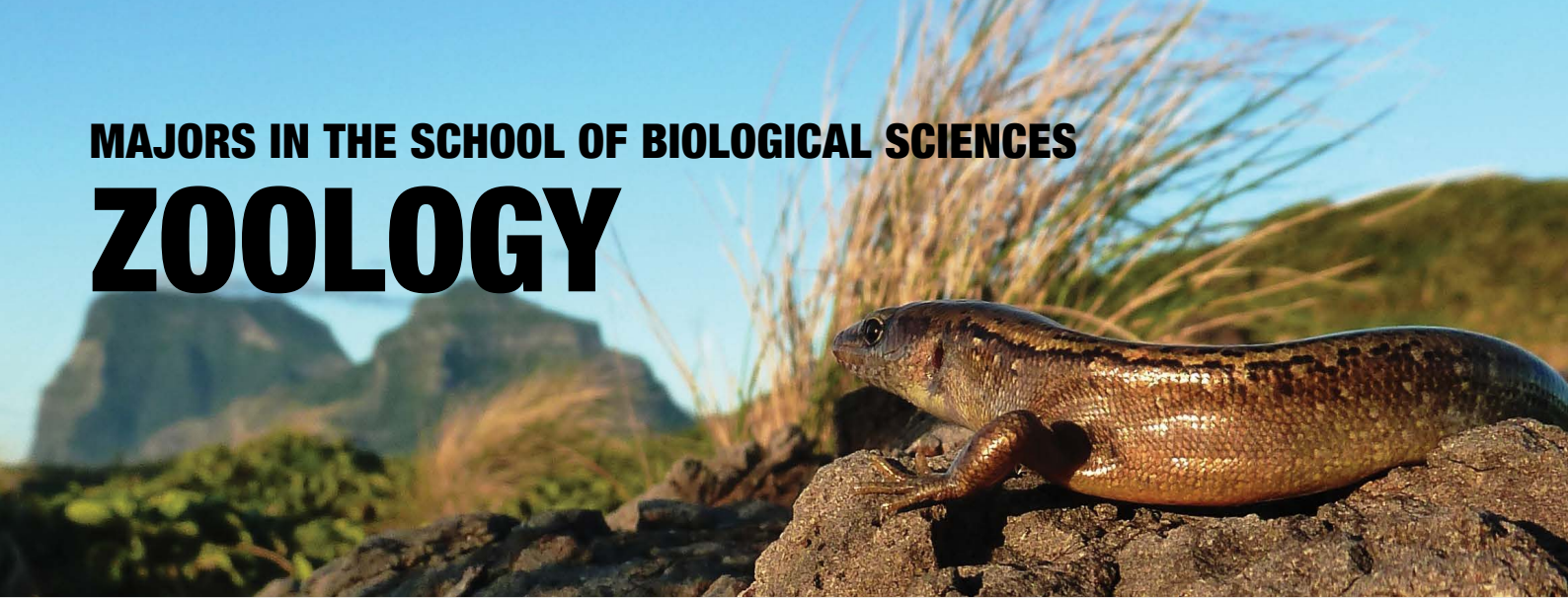
Currently working at an AgriTech startup, Bridget credits their degree with helping shape their career path.

I started in plant sciences and now I've moved into a more data-driven role. The skills I've gained – from lab work to analysis – have made a real difference."



# MAJORS IN THE SCHOOL OF BIOLOGICAL SCIENCES

# ZOOLOGY



## WHY IS ZOOLOGY SUCH AN EXCITING AREA OF SCIENCE?

Animals are vital components of natural systems, therefore studying zoology has enormous intrinsic and practical value. They are key components of the biodiversity that underlies ecosystem function. Animals are not only a major source of food, but may also represent threats (pests, parasites) to agriculture, aquaculture, forestry and human health. Thus, an understanding of animals and their importance leads to a better understanding of human behaviour and the impact that our species has on the world.

Zoologists study how evolutionary processes have led to the current diversity of animals, the form and function of animal species, as well as the behaviour, and ecology of animal species, and interactions with other species and the process.

## MAJOR RESEARCH AREAS IN ZOOLOGY

Research in the School of Biological Sciences spans a diverse range of areas within zoology. This research is often led by students or part of high profile international collaborations.

### **DETERMINING THE ROLE OF INVASIVE SPECIES IN SHAPING EMERGING ENVIRONMENTS**

Globalisation is resulting in the increased deliberate and unintentional movement of animals around the world. We study the factors that influence the likelihood that animals will be transported to areas outside of their native range and their capacity to establish in new environments. We also investigate the evolutionary changes that occur in both the invader, and the native biota, during the introduction process.

### **BEHAVIOURAL RESPONSES TO A CHANGING WORLD**

Humans are having a dramatic impact on the natural world through the modification of landscapes, the pollution of environments, and their contribution to changing climatic conditions. We study how these anthropogenic factors are impacting foraging behaviour and diet selection, social behaviour, mating decisions, antipredator responses, and habitat utilisation of animals.

### **UNDERSTANDING THE PHYSIOLOGICAL AND GENETIC BASIS OF ADAPTATION TO ENVIRONMENTAL CHANGE**

Our researchers are investigating how evolutionary, physiological and ecological processes can be incorporated into conservation and management of biodiversity. This is being achieved through a combination of field studies, lab and field based experiments, ecophysiological modelling, quantitative genetics and ecological genomics to understand how organisms adapt to a changing environment.

### **THE ROLE OF EVOLUTION IN DRIVING DIVERSITY WITHIN AND AMONG SPECIES**

Evolutionary biology focuses on the processes that generate diversity, and select upon the diversity present within a species. This diversity can take the form of genetic, morphological, phenotypic, behavioural or physiological variation. We study mating competition and reproductive conflicts, the evolution of life histories, organelle genome evolution, and the evolution of male fertility.

### **INVESTIGATING THE RELATIONSHIP BETWEEN MORPHOLOGY AND FUNCTION**

The morphological structures of animals are generally suited to the environments that they live in and the function that the structures have in the animals' life. Our research focuses on the evolutionary underpinnings of the relationship between morphology and function. This relationship is being used to address questions relating to maximum body size in animals, including global patterns of increase and maximum rates of evolutionary change.

Zoology is the study of animals, their diversity, evolution, form, function, behaviour and ecology.

## COURSE STRUCTURE

First year	Second year	Third year	Total Points
<b>Major</b>			
BIO1011 and one of BIO1022 or BIO1042	BIO2231, BIO2242 and BIO2010	BIO3052, BIO3132, BIO3021 and any other Level 3 BIO or GEN Units	48
12 points	18 points	18 points	
<b>Minor</b>			
BIO1011 and one of BIO1022 or BIO1042	BIO2231 and BIO2242		24
12 points	12 points		

### ZOOLOGY ACADEMIC ADVISOR AND COORDINATOR: PROFESSOR ALISTAIR EVANS

Zoology is the study of animals, their diversity, evolution, form, function, behaviour and ecology. Animals are integral components of natural systems and they interact with other animals, with plants, which are ultimately the source of nutrients and shelter, and with microbes, which enable many animals to effectively utilise plants as food. Study in zoology can be undertaken at the level of the whole animal down to the level of cell biology, biochemical processes and their genetic control.



## BRIGITTA GUNAWAN

### BACHELOR OF SCIENCE

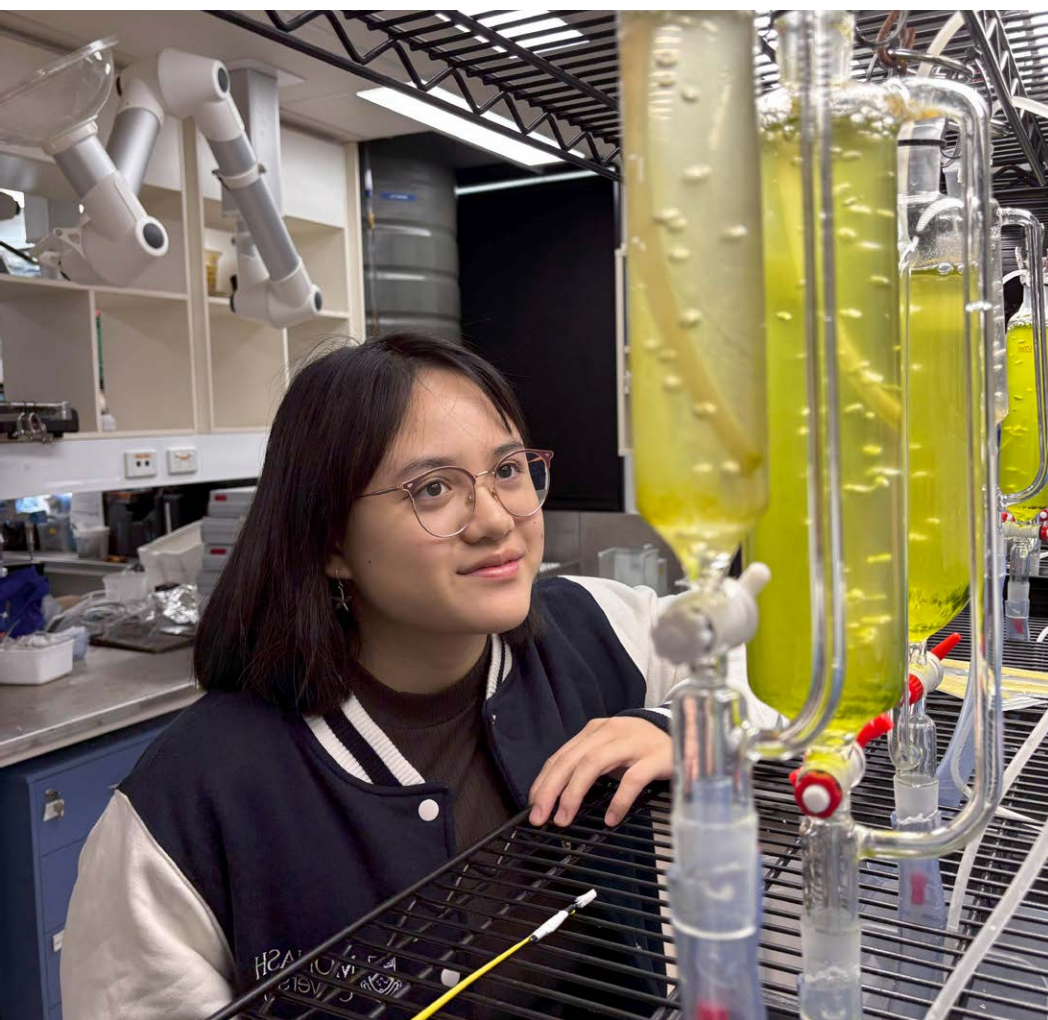
#### MAJOR: ECOLOGY AND CONSERVATION BIOLOGY

Brigitta has been passionate about preserving marine environments since high school. She started a project on ocean conservation, which has now turned into the non-profit organisation 30x30 Indonesia.

At Monash, she has taken advantage of the opportunity to develop her independent, practical research skills by taking a third year Biology research in action project that aligns with her advocacy for marine protected areas. She is conducting a systematic review to investigate the effects of marine fish egg size on larval performance, supervised by Professor Dustin Marshall.

Coming from Indonesia, Brigitta used field trips embedded in her undergraduate units to start exploring Victoria. She's visited several shoreline sites to map their elevation, collect data on sediments, and perform quadrat-sampling along the beach, then travelled to the Dandenong Ranges to collect data on trees, comparing wet and dry forests.

She is keen to pursue an honours year and potentially a PhD down the line, to help explore careers in her areas of interest – research, conservation non-profits, and international diplomacy.



# STUDYING BIOMEDICAL SCIENCES AS PART OF A SCIENCE DEGREE

Studies in biological sciences also support studies in the biomedical and behavioural sciences, in areas including biochemistry, anatomy and developmental biology, human pathology, immunology, microbiology, pharmacology, physiology and psychology.

There are two major pathways to studying biomedical sciences at Monash.

You can enrol in a dedicated Bachelor of Biomedical Sciences degree through the Faculty of Medicine, Nursing and Health Sciences.

Or, you can enrol in a Bachelor of Science degree through the Faculty of Science.

**In this second option, you study biology in first year then have the option of focussing on any of the following majors in second year and beyond:**

- biochemistry
- anatomy and developmental biology
- genetics and genomics
- immunology
- pharmacology
- microbiology
- physiology
- psychology
- human pathology.

Studying biomedical sciences as part of the science degree has the advantage of greater freedom and more flexibility.

Without the core, compulsory units required for a biomedical sciences degree, you are free to focus more intensively on the subjects that particularly interest you.

The absence of core units also provides more scope to pursue interests outside of science, allowing you, for instance, to take subjects from other faculties (arts, economics, etc.) that are difficult to fit into the schedule of the biomedical sciences degree.





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## **FURTHER INFORMATION**

### **MONASH UNIVERSITY**

[monash.edu](https://monash.edu)

### **FIND A COURSE**

[monash.edu/study](https://monash.edu/study)

### **FUTURE STUDENT ENQUIRIES**

**Australian citizens, permanent  
residents and New Zealand citizens**

[monash.edu/study/contact-us](https://monash.edu/study/contact-us)

### **International students**

T Australia freecall: 1800 MONASH (666 274)

T +61 3 9903 4788 (outside Australia)

E [study@monash.edu](mailto:study@monash.edu)

## **MONASH BIOLOGICAL SCIENCES ONLINE**

### **WEBSITE**

[monash.edu/science/future](https://monash.edu/science/future)

### **FACEBOOK**

MonashBiolSoc

### **INSTAGRAM**

[monash\\_science](https://www.instagram.com/monash_science)

### **TIKTOK**

[@monash\\_science](https://www.tiktok.com/@monash_science)

### **X**

[@MonashBiol](https://twitter.com/MonashBiol)

### **YOUTUBE**

Monash University Faculty of Science

## **MONASH SCIENCE WEBSITE**



## **YOUR ESSENTIAL GUIDE TO MONASH SCIENCE**

