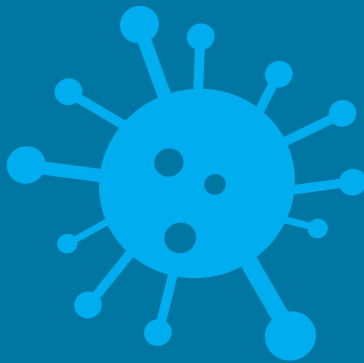
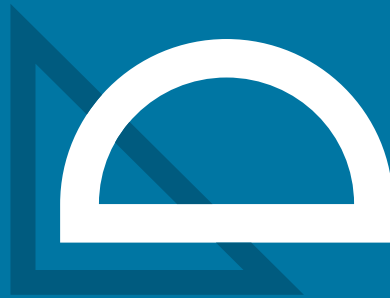




UNSW
SYDNEY

Australia's
Global
University

Faculty of Science Postgraduate Research



Considering a Higher Research Degree?

UNSW Science is at the forefront of many new scientific developments and is renowned for the exciting research and the quality of its postgraduate research students who are highly sought after.

As well as being able to undertake exciting research with world-leading supervisors, students receive opportunities for international travel, media training and exposure. They receive great career preparation through valuable academic networks and industry links.

The diverse range of research conducted at UNSW Science covers areas ranging from predicting climate change to treating important human diseases.

Research at UNSW Science is undertaken through Schools, Research Centres and Field Stations.

UNSW research and teaching is cutting edge due, in part, to the instrumentation and support provided by [The Mark Wainwright Analytical Centre](#). The Centre's major Research Facilities are accessible to all staff and students of UNSW. Staff of the Centre provide research collaboration, technical support, education and training to researchers accessing the facilities. The facilities included Biomedical Imaging Facility, Bioanalytical Mass Spectrometry Facility, Biological Resources Imaging Facility, Electron Microscope Unit, Nuclear Magnetic Resonance Facility, Spectroscopy Laboratory, Solid State and Elemental Analysis Unit, Lowy Biorepository, Commercial & Consulting, Transgenic Animal Unit & Stats Central.

To view the exciting opportunities on offer, and to find a potential supervisor, please take a look at the research areas and contacts offered by our Schools on the following pages.

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Research Opportunities

Name

Entry

Research Practicum	3-6 months	The Study Abroad Research Practicum program is designed for students from both partner and non-partner institutions to undertake short term research visits at UNSW. Tuition fees are payable directly to UNSW.
Honours	1 year	Honours is a one year program usually undertaken after a three year undergraduate degree. In some Schools where degrees lead to professional accreditation, Honours is embedded within the undergraduate program and is mandatory. An Honours program provides students an opportunity to conduct original research under the supervision of an academic staff member. Students learn new research techniques as well as skills such as time management and problem solving, and receive the foundation to proceed to a higher degree of research.
Master of Philosophy	1.5-2 years	A Master of Philosophy (MPhil) degree provides an opportunity for students to complete a component of course work including research methodology relevant to the field of study and a research project of at least 66% of the degree. The degree is ideal for students to acquire basic research training. An appropriate Bachelor degree in the relevant discipline from UNSW or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the appropriate Faculty Higher Degree Committee, usually at Honours level.
Master by Research	1.5-2 years	A Masters by Research degree requires completion of an original piece of research, more limited in scope and nature to that required for a PhD. Candidates develop mastery of appropriate methodology, and they present their findings in the wider context of their discipline. Students must have an appropriate four year Bachelor's degree with Honours from the University of New South Wales, or a qualification from another tertiary institution considered equivalent by Faculty Research Committee or Higher Degree Committee.
PhD	3-4 years	A completed undergraduate degree with Honours 2/1 or equivalent (for example at UNSW, this is graded as distinction level or 75%+), or; a completed Masters by Research degree or equivalent postgraduate qualification that includes a substantial research component written up as an academic thesis, awarded at or above distinction level or equivalent, or; In exceptional circumstances, sufficient evidence of research experience that clearly demonstrates exceptional research skills and the ability to undertake the proposed research program.
Post Doctoral Studies		UNSW welcomes applications from outstanding Australian and international early and mid-career researchers who are able to build capacity in areas of research strength. There are currently around 600 Postdoctoral Researchers at UNSW - their contributions and research performance are a key component of UNSW's research strategy.

Aviation

The School of Aviation is comprised of staff having an impressive range of backgrounds, encompassing academics who are research active scholars and industry experts who hold senior management positions. We pride ourselves on our high rate of employment for graduates both in Australia and internationally. Our partnerships with the industry provide our graduates with superior employment opportunities. With researchers who focus on aviation and transport safety, airline and airport operations, and airline economics and strategy, we capitalise on our strong applied research synergies with academics and industry.

Based within in the School of Aviation, Transport & Road Safety (TARS) Research is a research group at UNSW dedicated entirely to road and transport safety research. It capitalises on the strong research synergies in human factors and transport safety research between the TARS research team and existing researchers in Aviation.

The philosophy of the road and transport safety research focus at the TARS is the safe system principle, commonly used in occupational health and safety and adopted by the Australian Transport Council in 2004. This requires a multi- disciplinary approach to road safety research and policy development, where researchers focus on Safer Roads, Safer Vehicles, and Safer People and their integration into a Safe System.

A complete description of the research areas and projects can be found on [our website](#) and also [here](#). A summary of the topics listed on the next page, are available for study within the School with supervision from the nominated academic. In each topic, you will see a topic title, a description of the topic and a summary of academic background requirements. In general, successful applicants will need to have a suitable overall academic background as well as specific competencies suitable for the specific project.

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Aviation Projects

Aviation

- Airborne Remote Sensing (analysis of airborne data, mathematics, physics & computation) - Middleton
- Aviation Meteorology (mathematics, physics & computation) - Middleton
- Airline Strategy & Business Models (aviation or business) - Douglas
- Models of Air Travel Behaviour (geography and/or economics and/or aviation management with some econometric or operations research) - Koo
- Dispersal Measurement Approaches (geography and/or economics and/or tourism and/or aviation management) - Koo
- The Influence of Panic on Effective Decision-Making in Aviation (Aviation psychology – human factors – or psychology with flight experience) - Molesworth
- Risk Compensation in Aviation (psychology or human factors) - Caponecchia
- Fatigue on Commuter Trips (psychology or human factors). - Caponecchia
- Airline Scheduling & Performance Measurement (science/engineering/management. Stochastic models, statistics & simulations techniques). - Wu
- Applying Portfolio Theory to Tourism Marketing: Boosting Productivity via Strategic Diversification (commerce – finance or economics – aviation management or tourism). - Tan
- In addition to the above topics, students can also undertake research in all aspects of the following areas: Law & Regulations, Airport Operations Management, Airline Corporate Management, Safety & Accident Prevention, Airline Operational Management, Airport Planning, Security, Aviation Human Factors, Airline Accident Investigation Techniques, Inflight Services Management, Air Traffic Management, Ground Safety Investigation, Airline Incident Investigation.

- Active Transport (Cycling & Pedestrians) - Boufous and Hatfield
- Aviation Safety - Williamson
- Crash Investigation - Williamson
- Crash Reconstruction & Computer modelling - Mongiardini
- Distraction - Hatfield
- Drug & Alcohol - Boufous
- Fatigue - Williamson
- Heavy Vehicles - Friswell
- Indigenous Road Users - Senserrick
- Injury Surveillance & Data Linkage - Boufous
- Intelligent Transport Systems - Grzebieta
- Motorcycles - Senserrick
- Naturalistic Driving Studies - Grzebieta
- Novice Road Users - Senserrick
- Older Person Safety - Boufous
- Quad Bikes - Grzebieta
- Rail Safety - Friswell
- Road Safety Barriers & Roadway Departure - Grzebieta
- Rollover - Grzebieta
- Safety Management Systems - Williamson, Mooren
- Speeding - Mooren
- Trauma Services & Outcomes - Boufous
- Work-related Driving - Friswell

TARS

Biotechnology & Biological Sciences

The School of Biotechnology & Biomolecular Sciences (BABS) was formed in January 2002 following the amalgamation of the School of Biochemistry & Molecular Genetics, the School of Microbiology & Immunology, and the Department of Biotechnology and is now one of the largest and most prestigious schools of scientific research and teaching in Australia. The biomolecular sciences encompass the disciplines of chemistry, biochemistry, molecular biology and cell biology, and include the specialist areas of genetics, genomics, bioinformatics, proteomics and chemical biology. Biotechnology underpins much of the School's research. With distinguished academic staff, an innovative teaching program and state-of-the-art facilities, BABS is producing graduates and scientific discoveries of international renown.

BABS trains over 150 Higher Degree by Research students each year, and employs 35 academics, 44 research associates and 18 professional and technical staff. BABS consistently attracts government and industry funding, and top-tier academic accolades. Research in BABS spans fundamental to applied sciences.

In addition, BABS is home to a number of research centres that conduct cutting-edge research and provide specialist services in their respective fields including the [Ramaciotti Centre for Genomics](#) and [The New South Wales Systems Biology Initiative](#).

Research is also greatly facilitated by the presence of a number of discrete research facilities that the School has developed and maintains, including [Dingo DNA testing](#), [UNSW Recombinant Products Facility](#), and [Seahorse Extracellular Flux Analyser](#).

An overview of the School's current research capacity can be downloaded [here](#).

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BABS Projects

Environmental Microbiology

Members of this research group address globally relevant research themes in:

- Environmental health & sustainability - Cavicchioli, Brown, Burns
- Microbial processes - Manefield, Cavicchioli
- Environmental genomics - Cavicchioli, Burns
- Biodiversity & conservation - Cavicchioli, Burns
- Bioprospecting for enzyme & drug discovery - Cavicchioli

These areas of research translate fundamental discovery science into practical societal and economic benefits in the areas of:

- Novel biocatalysts & bioactives - Manefield, Marquis, Bridge
- Biofilm & biofouling control - Kjelleberg
- Water quality & water re-use - Ferrari
- Bioremediation & biofuels - Manefield, Marquis

Systems & Cellular Biology

- Cholesterol & sterols - Brown, Yang
- Cell stress & ageing - Ballard, Yang
- Genetic mapping of phenotype & disease - Ballard
- Protein interaction networks & systems biology - Wilkins, Edwards
- Targeting glucose transporters in endometrial cancer - Hoehn
- Increasing energy expenditure for treating obesity & insulin resistance - Hoehn
- Role of neuronal splicing factor A2BP1/RBFOX1 in autism spectrum disorders - Voineagu
- Genomic diversity in the human brain: the functional role of expandable DNA repeats - Voineagu
- Evolution of mammal sex chromosomes - Waters

Molecular Medicine

Molecular Medicine combines fundamental biological and biomolecular sciences with applied biotechnology and medical focus.

- Interaction of cancer chemotherapeutic agents with human telomeric DNA sequences - Murray
- The role of transcription factors in development & disease; molecular genetics & gene regulation - Crossley
- Production of antioxidants - Bridge
- Mechanisms of neuronal, brain development & memory - Janitz, Sytnyk
- Microexon dysregulation in multiple system atrophy - Janitz
- Microbe resistance to antimicrobial nanosilver - Marquis
- Repurposing existing treatments for brain cancer - Lutze-Mann

Infectious Diseases

Research focus on molecular mechanisms and epidemiology of microbes affecting both human and animal health.

- Evolution of pandemic norovirus - White
- Mathematical, computational & statistical methods to understand biological systems - Tanaka
- Molecular evolution & population structure of bacterial pathogens including *Bordetella pertussis*, *Salmonella enterica*, *Shigella*, *Vibrio cholerae* & *Campylobacter* species - Mitchell, White, Lan, Zhang
- Mucus-associated bacteria in inflammatory bowel disease - Mitchell, Zhang
- Cancer causing viruses - Whitaker
- Transcriptional & post-transcriptional regulation of bacterial virulence - Tree

Biological, Earth & Environmental Sciences

The School of Biological, Earth & Environmental Sciences (BEES) examines our planet from the earth's core to its upper atmosphere, from deep in time to the present and modelling towards the future. BEES is one of the highest performing research-intensive Schools at UNSW, with a number of areas in biology and environmental sciences being rated well above world standard in the 2015 ERA rankings, and for the Earth Sciences the only University in Australia to achieve this distinction. Our research is led by prize-winning scientists.

Research within BEES is clustered within four general thematic areas;

- Ecology and Evolutionary Biology
- Climate Science
- Environmental Change, Sustainability and Resources
- Palaeoenvironments and Earth History

The School in its entirety allows for a complete exploration and understanding of the Environment and world around us. A short summary of the key BEES research areas can be found [here](#). Research is carried out within the school and associated research centres.

Associated Research Centres:

- [Australian Centre for Astrobiology \(ACA\)](#)
- [Centre for Ecosystem Science \(CES\)](#)
- [Centre of Marine Bio-Innovation \(CMB\)](#)
- [Climate Change Research Centre \(CCRC\)](#)
- [Connected Waters Initiative](#)
- [Evolution & Ecology Research Centre \(E&ERC\)](#)
- [Palaeontology, Geobiology & Earth Archives Research Centre \(PANGEA\)](#)

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BEES Projects

Ecology & Evolutionary Biology

- Impact of overgrazing on ecosystem functions of shrublands - Eldridge
- Human dispersal & early peopling of East Asia & Australasia - Curnoe
- Evolutionary & behavioural ecology, genetic & nongenetic inheritance - Bonduriansky, Nakagawa, Sherwin
- Australasian Biogeography (BioAtlas) - Ebach
- Repeatability of evolution & its implications for biodiversity - Ord
- Sex, diet, death, evolution, behaviour, genetics, attractiveness - Brooks
- Systematics, entomology, biogeography, co-evolution, macroecology - Cassis
- Plant ecology evolution, phylogenetics, carbon cycling - Cornwell, Poore
- Microbiology, Marine biology, Microbial Ecology - Egan, Steinberg, Suthers, Thomas
- Marine ecology, ecosystem engineers, behaviour, invasion ecology - Gribben, Vergés, Moles
- Estuary health, anthropogenic impacts on marine & estuarine environments - Johnston
- Conservation biology, animal communication, human-wildlife conflict - Jordan, Letnic, Schwanz
- Evolution, ecology, behaviour, mating strategies - Kasumovic
- Vegetation dynamics, population & ecosystem modelling, fire - Keith
- Rivers, wetlands, conservation biology - Kingsford, Tulbure
- Predator-prey interactions, communication, Antarctic wildlife - Rogers
- Human geography, social science methods - Shaw

Climate Science

- Land surface processes - Pitman, Abramowitz
- Land-atmosphere interactions, water cycle, remote sensing - Evans
- Atmospheric physics - Sherwood
- Oceanography - England, Maharaj, Sen Gupta, Meissner
- Climate Extremes - Alexander
- Climate variability and change - Alexander, England, Sen Gupta
- Energy & climate policy and climate impacts - Green
- Urban climate - Hart
- Paleoclimate, earth system science - Meissner, Turney
- Climate model evaluation - Abramowitz
- Ocean carbon cycle & biogeochemistry - McNeil

BEES Projects

Environmental Change, Sustainability & Resources

- Vulnerability to climate impacts - Green
- Coastal geomorphology, rip currents, beach hazards & safety - Brander
- Exploration & environmental geochemistry - Cohen
- Tsunami, natural hazards, coastal geomorphology - Goff
- Mineralogy, petrology, ore deposits, gemstones - Graham
- Urban climate, biometeorology, energy consumption & climate - Hart
- Earth system science, 3D geological modelling, water - Kelly
- GIS, spatial awareness - Laffan
- Remote sensing, forests, biogeography, carbon, land cover - Lucas
- Environmental management, spatial analysis & modelling - Metternicht
- Environmental change of the late halocene & human impacts - Mooney
- Aquaculture, coastal resource management, fisheries - Sammut
- Soil science, digital soil mapping, environmental geophysics - Triantafyllis

Paleo environments & Earth History

- Palaeontology, Mammalogy, Conservation Biology, DeExtinction - Archer
- Ground water, paleoclimate, geochemistry, cave & karst science - Baker
- Southern Hemisphere glaciology, palaeoclimatology - Fogwill
- Palaeontology, evolution, systematics, biogeography - Hand
- Mars lab, virtual field trips - Oliver
- Archean tectonics, early life, global geodynamics - Kranendonk

Chemistry

The School of Chemistry at UNSW is recognised nationally and internationally, for producing world-class fundamental and applied research in the field of Chemistry to address real-world challenges. The School's research is focused on four key themes: Nanoscience, Catalysis & Industry, Energy & Environment, and Medicinal Chemistry.

Chemistry at UNSW consistently ranks in the top 100 in the world in major league tables such as the QS ranking (2011-2016) and the Jiao Tong Academic Ranking of World Universities in Chemistry (2009-2011 and 2013). It was also ranked no 1 in Australia and no 8 in the Asia-Pacific Region in terms of publication impact 2000-2010 by the Times Higher Education World Universities Ranking. The Excellence in Research in Australia (ERA) gave Chemistry at UNSW a rating of 5 - the highest rating possible and well above world standards. The ERA ranked the University's performance as at, above or well-above world standard in all the sub-disciplines of Chemistry.

The School is home to leading academics including Fellows of the Australian Academy of Science & Members of the Order of Australia (David Black - FAA & MBO, Les Field - FAA & MBO, Justin Gooding, FAA), two winners of the 2013 NSW Science & Engineering Award (Justin Gooding & Martina Stenzel), and recent winners of the Faraday Medal (Justin Gooding) and the Australian Academy of Science Le Fevre Memorial Award (Martina Stenzel & Pall Thordarson).

A full description of the research in the school, and student research opportunities can be found on our [website](#).

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Chemistry Projects

Nanoscience

Fabrication of new nanomaterials will have important applications in analytical chemistry, electrochemistry & surface science. Specific areas of interest include:

- **Designer surfaces** leading to biosensors, optoelectronic devices, organic electronics, biomaterials
- **Nanostructured materials** for catalysis, gas adsorption, molecular sieves & sensing
- **Nanoparticles & nanosheets** as nanoscale building blocks for biolabelling, bioelectronics, gas adsorption & molecular electronics
- **Nanomedicine** for improved treatments & better ways to deliver drugs

Leaders: Beves, Donald, Gooding, Stenzel, Stride, Thordarson

Energy & Environment

The chemical industry consumes around 1/3 of global energy demand in the processes used to produce synthetic materials, agrochemicals and medication.

- **Energy generation:** photo-sensitive materials allow us to capture energy directly from the solar spectrum; bio-mimicry of photocatalysis potentially provides a cheap and convenient alternative to current photovoltaic devices, using water as a fuel source. Transitioning from the use of fossil fuel reserves will continue to rely on heavily polluting technologies which will benefit from carbon capture technologies.
- **Energy storage:** mobile devices require highly efficient methods of storing the energy used to drive them, whilst charging cycles need to be highly flexible; in order to deliver solutions, we need new materials designed from the bottom-up.

Leaders: Kable, Schmidt, Sharma, Zhao

Catalysis & Industry

Around 90% of chemical processes involve the use of catalysts to enhance production efficiency and reduce energy use.

- **Catalytic chemistry:** for efficient and selective synthesis, and nitrogen fixation and carbon dioxide sequestration.

Leaders: Ball, Colbran, Cole, Field, Harper, Nguyen

Medicinal Chemistry

Synthetic methodologies have become sufficiently sophisticated to allow the design and synthesis of completely new yet active structural types. Specific programs include:

- **The design & understanding of bioactive molecules:** heterocyclic chemistry for therapeutic compounds, exploration of DNA-drug interactions
- **Natural product chemistry:** flavinones as dietary supplements, the mode of action of antifreeze proteins
- **Developing drug delivery vehicles** aimed at pin-pointing activity
- **Synthesis of macrocycles** that target protein-protein interactions including controlling the heat shock response in cells or inhibiting the ribosomal machinery both which induce apoptosis.

Leaders: Black, Edwards, Hunter, Kumar, McAlpine, Morris

Materials Science & Engineering

The School of Materials Science and Engineering at UNSW combines science and technology to develop practical solutions to make a difference in a technology enabled society. MSE is about developing the very best materials for every human-made application.

Our School is recognized as the leading MSE program in Australia and is among the top 50 in the world (QS World Rankings 2016). We currently have Australia's largest undergraduate and postgraduate programs and our teaching staff are internationally renowned. Our research interests are grouped into five broad fields – ceramics, functional materials, polymers & composites, physical metallurgy and process metallurgy.

Students benefit from our ongoing investment to provide world-class facilities. A state-of-the-art new building and some of the world's most cutting edge equipment allows for the fabrication and characterization of a wide range of material classes as well as the development of advanced processing techniques.

The School is home to one Australian Research Council Laureate Fellow and four Future Fellows who, along with our other staff, make major contributions to Australian and international science and industry. We are connected to industry through partnerships with a number of internationally recognized corporations. The School currently has several major research centres, funded by the Australian Research Council and other sources. These include:

- Centre for Sustainable Materials Research & Technology (SMaRT@UNSW)
- ARC Centre for Excellence in Future Low-Energy Electronics Technologies
- UNSW & Hangzhou Cable Co. Ltd (HCCL) Joint Laboratory
- The Baosteel-Australia Joint Research and Development Centre

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Materials Science & Engineering Projects

Ceramics

- Phase equilibria of ceramic systems
- Non-oxide ceramic processing & properties
- High-temperature superconductors
- Powder processing, densification, & crystal growth of ceramics
- Glass & glass-ceramics
- Ceramic-matrix composites
- Microwave processing of ceramics
- Gemstones
- Electrophoresis of ceramics
- Cements & concrete
- Photocatalytic titania for water splitting
- Modelling of densification & grain growth
- Processes in ceramics
- Microstructure-property relationships in ceramics
- Zirconia ceramics
- Nanocomposites
- Piezoelectric ceramics
- Bioceramics
- Ferroelectric ceramics
- Fracture & wear of ceramics
- Actuation mechanisms in electro-ceramic materials

Leaders: Sorrell, Standard, Daniels, Hart, Hoffman, Wang

Functional Materials

- Functional oxide materials
- Fast-ion conductors
- Quantum crystals
- High pressure physics
- Gas-absorbent materials
- Electronic & photonic materials
- Semiconducting oxides
- Magnetic & ferroelectric materials
- Photovoltaic materials
- Electrochromic materials
- Spintronics & oxide electronics materials
- Soft & hard magnetic materials
- Hydrogen storage alloys
- Ni-MH Batteries
- Graphene & other 2D materials
- Supercomposites
- Membranes
- Water purification & nanofiltration
- Dessicant materials
- Packing & compaction of powders

Leaders: Daniels, Hart, Hoffman, Wang, Cazorla, Chu, Li, Chan, Munroe, Valanoor, Seidel, Yi, Joshi

Polymers & Composites

- Polymeric bio-electrics in tissue engineering
- Sutureless conductive patches for cardiac regeneration
- Conjugated nanoparticles for photo-thermal therapy
- Aerospace materials
- Metal- & polymer- matrix composites
- Adhesive bonding
- 3D biological scaffolds

Leaders: Crosky, Mawad

Materials Science & Eng Projects (cont'd)

Physical Metallurgy

- Corrosion Engineering
- Hydrogen Embrittlement
- Neutron scattering & polarised neutron reflectometry
- Moun spin relaxation & positron annihilation spectroscopy
- Fatigue, creep & failure of metals
- Development of new classes of bulk metallic glasses (BMGs)
- Recovery/recrystallization mechanisms in deformed single-phase & two-phase alloys
- Design of multilayered hybrid sheet structures for optimising mechanical properties
- Development of microstructure & texture in materials by thin-strip casting
- Crystalline high entropy alloys
- High entropy brasses & bronzes
- Beta & alpha + beta magnesium rare-earth alloys
- 3D printing of lightweight alloys
- Thermo-mechanical processing
- Early stages of precipitation
- Grain boundary engineering
- Advanced steels
- Nickel-based alloys
- Refractory metals
- Materials degradation at high temperatures in gas atmospheres
- High temperature materials development
- Thermodynamics & kinetics of gas-solid reactions
- Oxidation & carburisation of metals at high temperatures
- Nano-coatings for high-temperature applications

Leaders: Chan, Munroe, Valanoor, Crosky, Ferry, Laws, Primig, Young, Zhang

Process Metallurgy

- Chemical vapour deposition
- Sustainable processing of materials
- Numerical modelling of multi-phase flow
- CFD-DEM simulation of fine powder dispersion
- Multi-scale modelling of grinding process
- Fluoride-free mould flux for steel continuous casting
- New ironmaking & steelmaking technologies
- Sustainable processing of materials
- Recycling waste plastics & rubber tyres
- Ferrous & non-ferrous materials processing
- New direct ironmaking technologies
- Reduction of iron ore
- Kinetics of liquid/solid/gas reactions in metallurgical processes
- Mathematical modelling of metallurgical processes
- Refractory reactions in metals processing
- Utilisation of waste materials in metals processing
- Materials degradation at high temperatures in gas atmospheres
- High temperature materials development
- Thermodynamics & kinetics of gas-solid reactions
- Fluoride-free mould flux for steel continuous casting
- New ironmaking & steelmaking technologies

Leaders: Joshi, Yang, Ostrovski, Sahajwalla, Zhang

Mathematics & Statistics

An Outstanding Mathematical Research Centre

In addition to our role of teaching students of mathematics, science, engineering and many other areas, the School is one of Australia's most important centres of mathematical research. In each of the last five years its external funding has been more than three million dollars, which is more than the total external research funding of many universities.

Our expertise ranges across wide areas of applied mathematics, pure mathematics and statistics, including financial mathematics, biomathematics and environmental statistics.

Research areas for postgraduate research projects are fully listed and outlined [here](#), the research areas and groups are outlined on the next page.

International & Industrial Collaboration

A feature of the School's research is the unusually high level of international collaboration, supported by a dynamic visitor program. Each year, approximately one hundred mathematicians from around the world spend periods of two to four weeks as visiting professors in the School, conducting joint research with local mathematicians and statisticians, giving seminars and consulting with students. [The School has strong links with industry, in teaching and with collaborative research programs.](#)

Computing Facilities

The School's [computing facilities](#) are among the best in Australia. It has its own Computing Centre, which manages the Linux and Windows desktops environment, and a high performance Linux computational cluster. The School supports both numerical and symbolic computing and access to high performance computing and scientific visualisation facilities.

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Mathematics & Statistics Projects

Algebra & Number Theory

Homological, quantum and noncommutative algebra, and classical, analytical and geometric number theory.

Leaders: Angell, Brown, Chan, Du, Franklin, Grossman, Harvey, Massierer, Ostafe, Shparlinski, Voineagu, Wildberger, Zhao.

Bayesian & Monte Carlo Methods

The application of Bayesian methods, simulation via trans-dimensional Markov chains, approximate Bayesian computation, Monte Carlo methods for rare event simulation and heavy-tailed distributions.

Leaders: Botev, del Moral, Fan, Sisson.

Biomathematics

As the study of biological systems becomes more quantitative, the part that mathematical analysis plays increases, from macroscopic to microscopic modelling.

Leaders: Angstmann, Cai, Coster, Henry, Murray.

Biostatistics & Ecology

Development, application and evaluation of novel statistical methods for the applied sciences, especially for public health and ecology ("Eco-Stats").

Leaders: Olivier, Stoklosa, Warton.

Combinatorics

Graph theory, matroid theory, design theory, the interplay between algebra and design theory and applications to coding theory.

Leaders: Angell, Britz, Combe, Du, Greenhill, Isaev.

Mathematics & Statistics Projects

Computational Mathematics

Special focus on advanced methods for differential & integral equations, and algorithms for high dimensional problems.

Leaders: Dick, Kuo, Quoc Thong Le Gia, McLean, Sloan, Tran.

Finance & Risk Analysis

Innovative methods for financial modelling, derivative pricing & risk analysis.

Leaders: Chan, Dunsmuir, Li, Penev, Salopek.

Fluid Dynamics, Oceanic & Atmospheric Sciences

Highly coupled components of the climate system, the ocean carbon cycle, and ocean ecosystems modelling.

Leaders: Banner, Froyland, Holzer, Keating, McDougall, Morison, Roughan, Sisson, Zika.

Functional & Harmonic Analysis

Functions & functions of functions, with applications ranging from quantum physics to signal processing.

Leaders: Cowling, Doust, Golodets, Grossman, Pahor, Potapov, Sukochev, Wildberger.

Geometry

Our modern research agenda spans algebraic geometry, differential geometry, hyperbolic geometry, Banach space geometry and noncommutative geometry.

Leaders: Chan, Cowling, Doust, Harvey, Sukochev, Voineagu, Wildberger.

Maths & Stats Projects (continued...)

Mathematical Physics

Problems related to physics, including operator algebras, path integrals and quantization.
Leaders: Kress, Steele, Donovan.

Nonlinear Phenomena

Applications & theory of nonlinear equations, with studies in integrability, ergodicity, and fractional calculus.
Leaders: Angstmann, Froyland, Henry, Kress, Roberts, Schief, Steele, Tisdell.

Nonparametric Statistics

Making inferences about infinite dimensional parameters in statistical models, including wavelet methods, density estimation, binary regression, and functional data analysis.
Leaders: Chen, Geenens, Penev.

Optimisation

Finding the "best" way to do a task, subject to any restrictions. Research in optimisation includes model development, analysis, numerical techniques & applications.
Leaders: Froyland, V. Jeyakumar, Murray.

Stochastic Analysis

Mathematical & statistical modelling of systems evolving randomly in space & time, especially theory & methods of stochastic processes to financial risk management.
Leaders: Chen, del Moral, Dunsmuir, Li, Penev, Salopek, Sisson, Straka.

Optometry & Vision Science

The School is regarded internationally for strengths in contact lens, anterior segment and vision science research. Staff members are internationally recognised as being at the forefront of contact lens research, including the development and commercialisation of research in this area

The School offers a selection of research degrees, world class research facilities and the opportunity to work with internationally recognised leaders in the field. Students are well supported by excellent mentors, comprehensive research and translational skills training, and conference and networking opportunities. Our students are internationally recognised and our alumni can be found worldwide in clinical practice, teaching, research and industry positions. As well as the PhD and the MSc in Optometry or Vision Science, the School offers the Doctor of Clinical Optometry, DOptom (res), a part course work, part research program intended to suit the needs of clinicians interested in conducting research within a practice setting.

The School has a multidisciplinary approach to research, accepting students with a background in optometry/ vision science study for a higher degree alongside graduates from a variety of disciplines including ophthalmology, microbiology, psychology, education, biomedical engineering, physics, orthoptics and pharmacology. Students can choose from a diverse range of pure and applied research areas; from clinical optometry to public health and basic research.

The School has a unique position as it is co-located with a varied range of eye research and education institutes including:

- The Brien Holden Vision Institute, The Centre for Eye Health, Optometric Vision Research Foundation & Optometry Giving Sight.
- The Optics & Radiometry Laboratory (ORLab): an unparalleled international facility for photometry and colorimetry.
- The Orthokeratology Research (ROK) Group, who have established a distinctive and productive facility within the School.

Please note: Completion of a research degree at SOVS does not provide you with registration to practice clinical optometry in Australia.

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Optometry & Vision Science Projects

Anterior segment & contact lenses

- Tear film biochemistry, ocular homeostasis & pathology - Willcox, Stapleton, Kumar, Datta, Markoulli
- Ocular pain & symptoms in dry eye & contact lens wear - Golebiowski, Stapleton, Tan-Showyin
- Antimicrobial surfaces, contact lenses and lens cases - Willcox, Stapleton, Vijay, Datta
- Ocular surface innervation & sensory function in ocular surface health & disease - Stapleton, Golebiowski, Markoulli, Willcox, Jalbert
- Epidemiology of contact lens-related infection - Stapleton
- Ocular microbiology & bacterial pathogenesis - Willcox, Stapleton, Datta, Kumar
- Ocular surface disease: influence of obesity & nutrition - Jalbert, Golebiowski, Stapleton
- Biomarkers in ocular surface disease - Markoulli, Willcox, Jalbert, Golebiowski, Madigan, Stapleton
- Orthokeratology - Swarbrick, Kang, Maseedupally
- Myopia control - Kang, Swarbrick, Maseedupally, Hui, Watt
- Dry eye - Golebiowski, Stapleton, Jalbert, Markoulli, Hui, Datta
- Diabetes & the ocular surface - Markoulli, Willcox, Jalbert, Golebiowski
- Keratoconus, vernal keratoconjunctivitis, allergic conjunctivitis & other ocular surface conditions - Madigan, Stapleton, Jalbert, Golebiowski
- Ocular drug delivery - Hui, Willcox
- Ocular surface therapeutics - Tan, Stapleton, Jalbert, Hui
- Sex hormones & dry eye - Golebiowski, Stapleton, Tan-Showyin

Posterior segment in health & disease

- Role of the immune system in posterior segment disease - Madigan
- Retinal anatomy, physiology & pathology - Madigan, Kalloniatis, Nivison-Smith
- Ganglion cell structure & function relationship - Zangerl, Kalloniatis
- Glaucoma management - Kalloniatis, Zangerl
- Neurochemistry of the normal & diseased retina - Kalloniatis, Nivison-Smith
- Ocular disease diagnosis through ocular imaging - Kalloniatis, Nivison-Smith
- Ocular tumours, ocular melanoma - Madigan

Optics & Applied Vision

- A multi-modal optical coherence microscope for ultrahigh-resolution 3D imaging for ocular imaging - Roy
- Functionalized nanoparticle as contrast agent in bio-imaging - Roy, Stapleton, Willcox
- Blue light blocking lenses effects on visual & non-visual systems - Roy, Boon, Khuu, Dain

Vision Science

- Development of the visual system, amblyopia, colour vision - Boon, Asper
- Vision throughout the life span - Boon
- Binocular vision - Asper
- Low vision & visual rehabilitation, accident prevention - Boon
- Visual electrophysiology, visual psychophysics, detection of brain abnormalities - Boon, Khuu
- Visual processing - Khuu
- Surface & material perception - Kim, Khuu
- Multisensory experience of self-motion - Kim
- Digital devices (smartphones & computers), eye strain & dry eye - Asper, Golebiowski

Public Health Optom

- Access to eye care by asylum seeker & refugee communities in Australia - Golebiowski, Watt
- Quality of eye care, evidence-based practice, health systems research - Jalbert, Stapleton
- Optometry patients' use of alternative & complementary medicines - Jalbert, Golebiowski

Physics

The School of Physics at UNSW is well positioned to play its role as a leading centre of research excellence. Last year, the School received over five million dollars in external research funding, published over 200 refereed papers and made 90 conferences presentations. These are just some of the indicators of the School's reputation in research.

The School consists of five research departments:

- Acoustics
- Astrophysics
- Biophysics
- Condensed Matter Physics
- Theoretical Physics.

The school also hosts the **Centre for Quantum Computation & Communication Technology (CQC2T)** which has been designated an Australian Research Council Centre of Excellence. Follow the links for further information about the research and the staff of each of these departments.

On the next page is a listing of research projects available for research students and the research leaders. A complete description of Research Projects in the School of Physics can be found [here](#).

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Physics Projects

Acoustics

The Acoustics Lab offers a range of research projects in voice acoustics and music acoustics. These are usually developed in collaboration with the student based on singing voice or students interest in a particular musical instrument. Consult Joe Wolfe if interested.

Leader: Wolfe

Astrophysics

UNSW Astrophysics has research areas in Antarctic astronomy, Astrobiology, Exoplanetary science, Star Formation, Chemistry & Dynamics of the Interstellar Medium, Varying Fundamental Constants, cosmology, physics of the early universe, and Galactic archaeology. Some of the projects available include:

- **Astroinformatics: Where Big Data & astrophysics meet**
- **Unusual Chemistry in the Horsehead Nebula?**

Leader: Cunningham

- **Sounding stars using data from NASA's Kepler & TESS missions**

Leader: Stello

- **Parts-per-million polarimetry of stars at red wavelengths**
- **Polarization of B stars**
- **Atmospheres of the Solar system giant planets**
- **Infrared Emission from the Venus Night-Side**

Leader: Bailey

- **The near-infrared sky background in Antarctica**
- **Characterising the performance of a near-infrared spectrometer for Antarctica**
- **State-of-charge measurements for lithium iron phosphate batteries**
- **Analysis of astronomical data from Antarctica**

Leader: Ashley

- **FunnelWeb: The structure & history of the Galactic disc**
- **Using big data to find rare stars in the Galaxy**

Leader: Martell

- **SDSS III & Planck. Cosmological parameters from the Lyman alpha forest & combined Baryon Acoustic Oscillation quasar constraints on the neutrino mass.**

Leaders: Webb, Wong

- **Understanding Intrinsic Variability in Doppler Planet Host Stars**
- **FunnelWeb PhD 3 : Delivering M-dwarfs for a habitable-zone planet search**
- **FunnelWeb PhD 2: Delivering an Input Catalogue for NASA TESS**
- **FunnelWeb PhD 1 : The Hunt for Young Stars**
- **Parallaxes for L-type Brown Dwarfs**
- **Finding Cold Neighbours for the Sun**

Leader: Tinney

Biophysics

Biophysics are researching the physics of life in several different areas, in close collaboration with biologists & often with industrial partners.

- **Tripwire: Nanotube transistors for electronic read-out in maze-based biological computation**

Leader: Adam Micolich

- **Physical characterization of protein phase transitions**

- **Numerical modeling of an artificial molecular motor**

Leader: Paul Curmi, Krystyna Wilk

Physics Projects

Theoretical Physics

The group works on challenging problems of modern physics, such as high temperature superconductivity, quantum phase transitions, mesoscopic systems, quantum chromodynamics, quantum gravity, violation of the fundamental symmetries and tests of Grand Unification theories, the search for cosmological variation of fundamental constants in the evolving Universe predicted by string theories, atoms in strong fields, quantum chaos, and foundations of statistical mechanics. Members are involved in collaborations with numerous research groups in America, Europe, and Asia. The Gordon Godfrey fund finances visits by world-leading theoreticians for the purpose of collaborative research and an annual international research conference held at the University.

- **Fabry Perot interferometer with Quantum Point Contact**

Leader: Sushkov

- **Valley states of donors in silicon: a route to scalability?**
- **Charge transport in Weyl semimetals**
- **Dephasing of single-spin qubits due to charge noise**

Leaders: Culcer, Simmons

- **High energy physics from the cosmic microwave background**
- **Nonlinear effects of neutrino masses on cosmological observables**
- **Triaxial collapse of dark matter haloes & applications**
- **Matter-antimatter asymmetry from leptogenesis**
- **Cluster mass function from the excursion set theory**
- **Covariant formulation of cosmological perturbation theory**

Leader: Wong

- **Manifestations of Dark Matter & Dark Energy in atomic & astrophysical phenomena**
- **Theoretical underpinnings of a new optical atomic clock at CSIRO**
- **High precision atomic many-body calculations**
- **Violation of the fundamental symmetries & tests of Grand Unification Theories**

Leaders: Berengut, Flambaum, Dzuba

- **Heisenberg-Euler problem for vector bosons**
- **Superstrong laser field**

Leader: Kuchiev

Physics Projects (continued...)

Condensed Matter Physics

UNSW houses one of the strongest CMP departments in Australia, with eleven members of academic staff (inc five ARC Federation, Professorial or Future Fellows), and over fifty research fellows, technical staff and research students. Research is focussed on the electrical, optical, magnetic and thermal properties of advanced nanoscale materials, with potential applications in nanoelectronics, computing, memory elements, energy and biotechnology. The unique array of research facilities at UNSW includes cryogenic systems for measuring the motion of single electrons inside quantum devices operating at close to the absolute zero of temperature, full clean-room facilities, scanning tunnelling microscopes that can be used to make electronic devices at the atomic scale, advanced laser and raman spectroscopy laboratories, and high performance electron microscopes.

- Getting back an extra dimension - Nanodevices based on self-assembled semiconductor membranes via templated growth
 - Wrap-gate nanowire transistors with parylene insulators
- Leader: Micolich

- Plasmonic Coupling Between Two Optically Trapped Metallic Nanoparticles
 - Imaging through complex optical media
 - Stochastic Resonance in Subdiffusive Media: Theory & Experiment
- Leader: Reece

- Experimental quantum simulation with dopant atoms in silicon
 - Dispersive read-out of single dopant states in silicon
 - Hybrid Superconducting-semiconducting devices: a new paradigm for nano-sciences?
 - Scalability of quantum computation: investigating the spin states of a single hole bound to an acceptor atom
 - Single Atom Based Quantum Metrology
- Leader: Rogge, Tettamanzi

- Fabrication & characterisation of InGaAs nanostructures for quantum transport applications
 - Single Hole Transistors
 - Two dimensional hole conduction in single crystal diamond devices
 - Anomalous conduction in one-dimensional wires - unravelling a 25 year old mystery
 - Ballistic focussing of holes in semiconductor microstructures
- Leaders: Klochan, Hamilton, Srinivasan

- Multiplexing Multi-qubit Devices
 - Spin control of a precision qubit in silicon
 - Atomically Precise 3D Transistors in Silicon
 - A Singlet-Triplet Qubit in Silicon
 - Engineering donor molecules for silicon quantum computing
 - Developing a Logical Qubit in Silicon
 - Design & Fabrication of 3D Single Electron Transistor Atomic Precision Nano Device
 - Development of a donor based hybrid qubit in silicon
- Leader: Simmons

- Topological spin systems: thin films investigations by optical spectroscopy & neutron scattering
 - Organic Superconductors studied by Raman Light Scattering
 - Raman Light Scattering on Multiferroic Materials
 - Quantised Resistance at Room Temperature
 - Spin-orbit coupling & transport in the quantum Hall regime
 - Dynamical properties of quantum devices: from nanoseconds to hours
- Leader: Hamilton

- Spontaneous spin polarisations in hole systems induced by spin-orbit coupling
- Leader: Culcer

- Coherent spin control of organic electronics
- Leader: McCamey

Psychology

Psychology at UNSW is ranked #16 in the world by the 2015 QS world rankings by subject. It is the leading School in Australia and attracts more per capita research funding than any other School of Psychology. It is also the only School of Psychology in Australia to have attracted the highest rating (5 – well above world standard) in its submissions to all three of the Excellence in Research for Australia (ERA) assessments conducted by the Australian Government (2010, 2012, 2015).

Because of the success of the academic staff within the School in attracting external funding to support their research and that of their students, research facilities are of a very high standard. Research facilities within the school include newly refurbished and world-leading laboratories for research in cognitive psychology, perception, behavioural neuroscience, neuropsychology, developmental psychology, social psychology, experimental psychopathology, and applied experimental psychology. In addition, several purpose-built laboratories are available for research in the areas of clinical and applied psychology.

The School also enjoys excellent relations with a number of external agencies (including teaching hospitals, community health services and the National Drug and Alcohol Research Centre) involved in the provision of psychological services in Sydney and good opportunities exist for doing research in these field settings as well.

All students enrolling in a PhD program are provided with office space and a new high quality computer equipped with current versions of office productivity and statistical packages. Students have access to the University's computer network, email and web services and to the UNSW library's extensive database and document delivery systems. Students are provided with basic office equipment and resources and have access to discretionary funds to support more specialised research needs. The School encourages students to develop good lines of communication with researchers in other parts of the world and to attend relevant national and international conferences. Financial assistance is provided for this purpose.

Opportunities for paid part-time undergraduate teaching within the School are also taken up by most research students.

For more information on current research projects available within the School of Psychology at UNSW please visit our Research – Areas of Expertise pages on our [website](#).

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Psychology Projects

Clinical Psychology, Psychopathology, Neuropsychology

- Post-traumatic stress disorder & anxiety - Bryant
- Obsessive-compulsive disorders - Grisham
- Concept formation & categorisation - Hayes
- Developmental psychopathology - Kimonis
- Learning & experimental psychopathology - Lovibond
- Cognitive & other psychological disorders following brain injury - McDonald
- Illness anxiety disorder, somatic symptom disorders, anxiety & depressive disorders, and cyberchondria - Newby
- Post-traumatic stress disorder & anxiety - Pearson
- Psychology of eating & weight - Vartanian
- Schizophrenia & other psychotic disorders - Whitford

Cognition

- Associative learning in humans - Beesley
- Short-term & long-term memory - Donkin
- Concept formation & categorisation - Hayes
- Learning & categorization - Le Pelley
- Cognition, perception, and emotion - Most
- The mathematical laws underpinning cognition spans a variety of topics in psychology & cognitive science - Navarro
- Judgement & decision making - Newell
- Word recognition in reading & speech recognition - Taft

Behavioural Neuroscience

- Brain mechanisms underlying learning & cognition and the neural substrates underlying executive function, particularly with reference to animal models of schizophrenia - Killcross
- Multidisciplinary approaches to the study of brain mechanisms for learning & motivation - McNally
- Development of emotion, attention, learning, and memory - Richardson
- Behavioural & neural investigations of elementary learning processes - Westbrook
- The homeostatic regulation of ingestive behaviour & body weight; blood-brain-barrier transport of adiposity signals; behavioural & cardiovascular effects of dietary fatty acids and their metabolites - Begg
- The neural bases of anxiety - Graham
- The neural bases of the learning & motivational processes that control volitional, or goal-directed, action - Balleine
- The control exerted by environmental cues on instrumental action selection - Laurent

Perception

- How context affects our perception, and how our visual awareness might be related to the underlying neural processing - Clifford
- Visual perception; neuroimaging; visual cortex; psychophysics - Mannion
- Cognition, perception, and emotion - Most
- The mechanisms & application of mental imagery, hallucinations, decision-making, memory, metacognition, visual perception, learning, attention & awareness - Pearson
- Visual perception, attention - Spehar

Psychology Projects

Social & Health Psychology

- Anger & aggression in humans - Denson
- Psychological & social factors that influence medication effectiveness & side effects - Faasse
- Affect & social cognition - Forgas
- Interplay of motivation, emotion, & cognition - Harmon-Jones
- Psychology of eating & weight - Vartanian
- The adaptive functions of positive, social emotions - Williams

Forensic Psychology

- Eyewitness Testimony; Eyewitness Identification; Facial Composites; Juvenile Psychopathy - Kemp
- Evidence evaluation in criminal trials; improve the communication between experts and lay decision makers in forensic settings - Martire

Developmental Psychology

- Categorisation & inductive reasoning, memory development & relations between reasoning & memory - Hayes
- Development, assessment & treatment of callous-unemotional traits - Kimonis
- The development of memory & emotion during infancy & early childhood; the development of relational memory & the role it might play in representational flexibility - Richmond

How to apply for research

1. Find a research area

Before applying for a postgraduate research program, match your area of interest with those offered by our schools. A list of research areas can be found on the back page of this guide or at degrees.science.unsw.edu.au/postgraduate-research/degree. Each research program has specific entry and eligibility requirements. For more info:

- [Doctor of Philosophy \(PhD\)](#)
- [Masters by Research \(MRes\)](#)

More info – [UNSW Handbook](#) – (enter current year).

2. Find a supervisor

Before submitting an application, you must independently contact a UNSW researcher and secure their agreement to supervise your work. Proof of correspondence needs to be included in your application.

If you're having difficulty finding a researcher, contact the school's postgraduate research coordinator (see school's page of this guide), or the Faculty contacts (see back page of this guide).

Search help: unsw.to/researcher

3. Develop a research proposal

Your proposal needs to be sufficiently detailed to enable the University to determine if it's possible to provide adequate supervision and resources to support your research.

[More info.](#)

4. Prepare supporting documentation

Required documents may include your supervisor's agreement, research proposal, resume, all transcripts (degree results) and English language test results. Documents must be in English or include a certified English translation.

[More info.](#)

5. Submit your application online

Once you have secured a supervisor, developed a proposal and prepared supporting documents, you can lodge your application. International students need to apply for admission and scholarships at least six months before their planned starting semester.

[More info.](#)

Further information about UNSW

Accommodation

UNSW students have many options, from on and off campus university accommodation to private housing.

[More info.](#)

UNSW Early Years offers childcare for staff and students.

Info about childcare, and the procedures for enrolment, orientation and cancellation is [here](#).

Offers

If successful, you will be sent a full, or conditional offer. Please read your offer letter carefully before accepting. You will then need to enrol for the correct semester and have your enrolment form approved by your school

To accept: my.unsw.edu.au

Transport/Facilities

The main UNSW campus is on 38 hectares in Kensington, which is close to Sydney's CBD and other major attractions. It has many shops and services, including cafes, banks, medical and dental centres, a bookshop, supermarket and post office.

[More info.](#)

Student Visas

Most international students require a student visa to study in Australia. The Department of Immigration and Border Protection is responsible for issuing student visas to Australia.

[More info.](#)

English Requirements

All applicants must meet the UNSW English Language admission requirement.

[More info.](#)

Fees/costs

For the duration of the degree, international candidates are required to pay tuition fees. While domestic candidates are not required to pay tuition fees, some programs may include additional costs for laboratory kits and field trips.

[More info.](#)

Support

Student Development International can help with accommodation, visa issues, cultural support, advice on learning in a new environment and professional development.

[More info.](#)

Wellbeing

UNSW cares about a student's personal wellbeing as well as their academic success. A range of services to support this are available on campus.

[More info.](#)

Scholarships

Many scholarships are available for postgraduate research programs, from UNSW Australia, the Australian government, industry partners, and organisations from other countries.

[More info.](#)

FAQs

For further info about the Graduate Research School, [click here](#).

Postgrad Research Scholarships

UNSW assists postgraduate researchers by providing a wide range of prestigious scholarships. The scholarships provide a range of benefits such as annual stipends, living allowances and coverage of tuition fee costs, as well as funding and supplements for travel. Scholarships are available to support current and new postgraduate research candidates at UNSW.

Students can apply for the UNSW scholarships during their admission application, please see [How To Apply](#) steps for instructions and note the Key Dates. The UNSW scholarships available to International students are:

- International Postgraduate Research Scholarship (IPRS)
- University International Postgraduate Award (UIPA)
- Tuition Fee Scholarship (TFS) plus a Research Stipend
- UNSW/Home Country Joint Scholarships for China, Indonesia, Pakistan & Chile

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