

Journey in the Academic and Research world of Australasia

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Griffith University

Griffith University is an innovative university committed to multidisciplinary teaching and research, and the creation and communication of knowledge. It has five campuses in three cities across the Brisbane-Gold Coast corridor and with more than 30,000 students and 3,000 staff, is one of Queensland's largest universities.

The Griffith community comprises students from more than 80 countries around the globe, and academic staff who set a rigorous pace in the achievement of research and teaching excellence. This academic approach is founded in the sharing of knowledge across traditional boundaries. This interdisciplinary framework seeks to address and solve real world problems in the 21st century.

List of faculties

Arts & Communication
Business & Commerce
Education
Engineering & IT
Health
Law & Criminology
Music
Natural & Built Environment
Psychology
Science
Visual & Creative Arts

Relevant Science Undergraduate and Postgraduate Degree Information

Undergraduate Degrees

Bachelor of Biomedical Science (Gold Coast and Nathan)

This degree program develops knowledge and skills in the modern biosciences and clinical sciences, emphasising their application to medicine, biomedical research and health care services. This is an enhanced and challenging program and, as a pre-medical degree, provides most appropriate training for entry to postgraduate medicine. In the first year, students are introduced to the basic sciences underpinning biomedical science by studying cell and molecular biology, human biology, physiology and anatomy, molecular genetics, biochemistry and related subjects. The program's second and third years cover advanced biochemistry, physiology and molecular biology, molecular genetics, health emergency management, nutrition, microbiology, immunology, infectious diseases, pharmacology, neuroscience and molecular diagnostics.

Bachelor of Biomedical Science with Honours (Gold Coast and Nathan)

The Bachelor of Biomedical Science with Honours is a one year full-time or equivalent part-time program providing graduates with the opportunity to undertake

advanced study and research within the biomedical science field. This program is designed to provide students with a thorough training in applied scientific research and methodology and will also prepare students for higher degree studies and professional employment.

Bachelor of Biomolecular Science (Nathan)

Founded on the basic disciplines of biochemistry, molecular biology and the new genetics, the biomolecular sciences encompass other new disciplines such as functional genomics, proteomics and bioinformatics at the forefront of modern science.

Bachelor of Biotechnology (Nathan)

It covers biochemistry, chemistry, molecular biology, microbiology and bioengineering, which are the foundations of modern biotechnology. The strongly interdisciplinary program also includes a thorough treatment of molecular genetics, genetic engineering, proteomics, genomics, bioinformatics, plant biotechnology, immunology, medical biotechnology and diagnostics, bioprocessing, method and product development.

This is integrated with a study of the management, marketing, regulatory affairs and intellectual property issues associated with bioindustry business. Practical sessions provide expertise in molecular biotechnology and product and process development. The emphasis is on applying new knowledge in the biosciences to innovation in the biotechnology industries.

Bachelor of Biotechnology with Honours (Nathan)

The Bachelor of Biotechnology with Honours is designed to provide research training for graduate students from the Bachelor of Biotechnology. The degree consists of research training and completion of a research project in the School of Biomolecular and Biomedical Science. The degree will be assessed by coursework, thesis and seminar.

Bachelor of Science (Nathan)

Griffith's diverse and highly regarded Bachelor of Science programs teach the basic experimental, theoretical, computational and communication skills necessary for the practising scientist, as well as developing an appreciation of the place of scientific studies in the wider technological and social context.

In first year, students have the flexibility to choose from a broad set of courses to allow them to develop their interests which will form the basis of their further studies in Years 2 and 3. Majors include:

- Biochemistry and Molecular Biology - Examines biological phenomena at the molecular level, focusing on biomolecules, metabolism, genetics, growth, differentiation and disease processes.
- Biological Sciences - Explores the genetics and physiology of living organisms, from bacteria and viruses to higher plants and mammals, and provides an integrated understanding of aspects of the basic and medical sciences.
- Chemistry - Deals with matter and its transformations, and includes the preparation, properties, structure and reactions of pure substances, synthesised and natural.

- **Microbiology** - Microbiology is the study of microbes, which include bacteria, yeast and other fungi, protozoa, algae and viruses. Microbes dominate the biosphere and have a major impact on life. They are responsible for infectious diseases, water quality, food poisoning and spoilage, the fertility of the soil, and the quality of the environment. They are used extensively in biotechnology processes, including bioremediation and the production of foods, beverages and therapeutic goods.
- **Physical Mathematics** - Develops pure and applied mathematics skills, with an emphasis on the mathematics employed in the physical sciences.
- **Physics** - Develops the ideas and techniques of physics, and focuses on the fundamental properties of the universe and the laws governing the behaviour of events in the universe.
- **Science, Technology and Society** - Covers interdisciplinary studies of historical, social, economic, political and philosophical dimensions of science and technology.

Bachelor of Science with Honours

The Bachelor of Science with Honours is offered in the Biosciences, Chemistry, Chemical Physics, Applied Mathematics, Physics and Science, Technology and Society. The Biomolecular Science honours program can be undertaken after the completion of the Biochemistry and Molecular Biology, Microbiology or Biological Sciences undergraduate majors.

Postgraduate Degrees

Master of Science in Biotechnology / Master of Science in Biotechnology with Honours (Nathan)

The program in biotechnology provides students with access to professional careers in industry. This program trains science graduates in the requirements and practices of biotechnology, in particular, industrial scale processing, good manufacturing practice, quality assurance, time and project management. Ethical and legal considerations and intellectual property are also covered. Graduates who have the appropriate background skills gain professional experience by participation in industry-based projects. Practitioners in the field deliver the complementary coursework, as far as possible.

Master of Science in Clinical Biochemistry / Master of Science in Clinical Biochemistry with Honours (Nathan)

The programs in clinical biochemistry are offered in conjunction with the pathology departments of several hospitals. Students are given in-depth training in all facets of clinical biochemistry, analytical instrumentation and other aspects of chemical pathology, and on-site training.

Master of Science in Clinical Microbiology / Master of Science in Clinical Microbiology with Honours (Nathan)

The programs in clinical microbiology provide students with direct access to professional careers in diagnostic laboratories in medical and public health centres. The range of programs responds to the need for well-trained scientists able to undertake and accept responsibility for the array of diagnostic procedures required in clinical and public health microbiology laboratories.

Master of Science in Clinical Physiology / Master of Science in Clinical Physiology with Honours (Nathan)

These programs train science graduates to make physiological measurements in a clinical situation and to aid in the diagnosis of disease and the management of patients. The courses emphasise an understanding of physiological and pathophysiological processes that form the basis of clinical measurements of a physical nature.

Master of Science in Genetic Counselling / Master of Science in Genetic Counselling with Honours (Nathan)

These programs provide students with access to professional careers in clinical genetics services in medical and public health centres. The program aims to facilitate the acquisition of knowledge and skills in genetics and counselling (at both the theoretical and practical levels), and in the nexus between the two. The program rests upon the principle of empowerment of people to make informed decisions and choices regarding issues that arise from genetic conditions.

Doctor of Philosophy (All Campuses)

The Doctor of Philosophy (PhD) is Griffith's premier research training degree. The PhD is awarded on the basis of a thesis prepared under supervision that makes an original, significant and extensive contribution to knowledge and understanding in the relevant field of study, as judged by independent experts applying accepted contemporary international standards. This program can be undertaken in schools and research centres.

Doctor of Philosophy by Publication (All Campuses)

The PhD by Publication allows for formal recognition of established researchers who do not already hold a doctoral level qualification, and who have substantial international standing in their fields based on their record of academic publication.

Master of Philosophy (All Campuses)

The degree of Master of Philosophy (MPhil) is awarded on the basis of a thesis prepared under supervision, which presents the results of original research in a scholarly form, demonstrating the candidate's knowledge of the research topic and the disciplines it embraces, as judged by independent experts applying accepted contemporary international standards.

Research highlights

Griffith University – A Biotech Research Leader

Griffith University has achieved an enviable reputation for its biotechnology capability, and is a world leader in a number of research areas.

An example of this is its partnership with AstraZeneca (1993 – 2007), which has provided \$100 million in funding to the Natural Product Discovery Group within the university's Institute for Cell and molecular Therapies. Other partners Griffith has worked with include GlaxoSmithKline, Sequenom, Gemini Genomics, Progen Industries, Meditech and Glykoz. In addition, our reputation has led to philanthropic support, provided by individual benefactors and Trusts & Foundations within Australia and overseas.

Griffith's biotechnology research is conducted by its research institutes and centres including: the Institute For Glycomics, the Institute for Cell and Molecular Therapies, the Genomics research Centre and the Heart Foundation research Centre.

There have been research breakthroughs in a number of areas including cancer vaccines, carbohydrate technology, high throughput screening, breast cancer diagnostics and therapies and adult stem cell research.

The Genomics Research Centre

Understanding the role of genes in health has been one of the greatest advances in contemporary medicine and Griffith University's Genomics Research Centre (GRC) is using gene mapping and characterizing gene dysfunction to explore new and novel approaches to treating conditions including migraine, multiple sclerosis, cardiovascular disease, cancer and obesity.

Diagnosing migraine remains difficult, however, GRC researchers have identified several genes involved in susceptibility to this debilitating condition, which may lead to better diagnostics and therapeutics.

Multiple sclerosis strikes people aged between 18 and 40, and after trauma, is the leading cause of neurological disability in young people. The cause remains elusive, but the GRC is working to identify gene expression differences in MS tissue to pinpoint the genes implicated in the disease.

Researchers are also using the genetically isolated population of Norfolk Island to investigate the interplay between environmental and genetic factors in hypertension (high blood pressure), obesity and high cholesterol – the major risk factors for cardiovascular disease. They are also probing an apparent link between a defect in the low density lipoprotein receptor gene and the development of obesity which affects almost one-third of adults in the western world. Research suggests the cause involves a genetic predisposition to environmental triggers.

Although only 10 per cent of breast cancer is inherited, gene variations and genetic susceptibility appear to be involved in the development of the sporadic (not inherited) form of the disease. The GRC is investigating this as well as the genes involved in breast cancer invasiveness.

High Potency Anti-cancer Vaccines is another important research area within the Genomics Research Centre. Over ten years Dr Steve Ralph and colleagues have developed technology that involves treatments to increase the immunogenicity of melanoma cells and induce anti-cancer immune responses. In mouse-model systems increased immunogenicity of treated melanoma cells has been clearly demonstrated. Patents are pending and there is evidence that these research outcomes have applications for a variety of cancers. Funding is required to take the research to a Phase 1 Clinical trial and Griffith University is actively seeking philanthropic support, commercial partners and investors to support the research.

The Genomics Research Centre has developed strong research linkages with practising clinicians to improve gene diagnosis, genetic counseling and the treatment of common genetic disorders. It collaborates with GlaxoSmithKline, Gemini Research and Sequenom and is seeking additional partners interested in the diverse conditions discussed.

The Institute For Glycomics

Griffith University's Institute for Glycomics is showing how carbohydrates (sugars) can be powerful medicines themselves with research already showing promising results in the treatment of cancer, multiple sclerosis and tuberculosis. Carbohydrates are involved in almost every aspect of biology – they recognise pathogens, help blood

clot and aid fertilisation. Most human cells have a coating of carbohydrates, called the glycocalyx, which is critical to the cell's development, survival and multiplication.

The Institute researches the role of carbohydrates in disease and aging to develop new drugs (glycopharmaceuticals), which will interfere with the biological process of disease. The applications represent a new avenue of treatment for metabolic disorders like cancer and diabetes; viral and bacterial diseases like cholera and tuberculosis; food poisoning; age-related diseases such as arthritis; and immune dysfunction including multiple sclerosis.

On its way to becoming a world-leading institute in this exciting new field, the Institute was established with a contribution of \$8 million from the Queensland Government and has already produced a spin-off company, Glykoz Pty Ltd, to develop the next generation pharmaceuticals to market by combining world-leading expertise in medicinal chemistry, clinical microbiology and drug discovery.

Halting the metastatic spread of cancer by developing carbohydrate-based therapeutics to hamper the disease's progress is one of the Institute's key projects.

The Institute for Glycomics is headed by Professor Mark von Itzstein, one of Australia's leading scientists and recipient of the Australia Prize in 1996 for his work in developing the anti-influenza drug Relenza™ (Zanamivir). The Institute is the only one of its kind in Australia and one of only six in the world using the key scientific disciplines of biology, chemistry and the structural and analytical sciences. This approach has already resulted in the worldwide marketing of Relenza™ and the Institute is working to commercialise the research outcomes from its multiple drug resistant tuberculosis research program.

The Institute For Cell and Molecular Therapies

The Institute was established in 2003 with a \$12 million investment by the Queensland Government. A number of technologies developed by the Institute are patented and available for license.

The Institute delves into life's most minute details – the molecular and cellular mechanisms of disease – to develop new drug and cellular therapies. Its neurobiology program is pioneering research into human brain disease, including spinal cord regeneration in the treatment of paraplegia which involves cells being transplanted from a paralysed patient's nose into the damaged spinal cord to help regenerate nerve pathways. It eliminates the problem of cell rejection and the ethical dilemmas of using stem cells harvested from embryos, and is currently being developed in a world-first clinical trial. Led by Professor Alan Mackay-Sim, this exciting program also has applications in the treatment of schizophrenia and Parkinson's Disease.

The Institute's natural product discovery program aims to discover and develop new therapeutic drugs derived from natural products extracted from plants and marine organisms found in Queensland's rainforests and the Great Barrier Reef. Research is focused on understanding the interactions between natural products and proteins. The program's collaboration with AstraZeneca since 1993 represents one of the most successful public/private sector partnerships in Australia.

The Institute's cell biology program explores the mechanisms involved in cell growth, differentiation and death, with studies ranging from basic genetic regulation and cellular differentiation, to the primary causes of specific diseases.

The chemical biology program uses small molecules to investigate biological function. A microbial gene research facility will soon allow research into the microbial modulators of protein function.

Breast cancer diagnosis and the treatment of breast cancer has been a research focus at the Institute for Cell and Molecular Therapies. The project called SenoSano (Italian

for healthy breast) is a program that covers: breast cancer diagnosis; breast cancer immunotherapeutic; drug targeting for a breast cancer therapeutic. A plan to move into phase 1 clinical trials with the immunotherapeutic SenoSano is a Queensland technology jointly owned by Griffith University, the University of Queensland and the Mater Medical Research Institute. The SenoSano program is based around a gene, G3BP2, which was discovered by Queensland scientist Dr Derek Kennedy in 1996. The initial discovery of G3BP2 has sparked intense international research with over 25 research publication addressing G3BP biology ranging from neurobiology virus replication, general cell biology and cancer progression. Dr Kennedy has a particular interest in breast cancer biology and shown that G3BP is involved in breast cancer progression and is specifically expressed in over 90% of human breast cancers (n=64 patients). Recently Dr Kennedy has collaborated with surgeons and researchers at the Mater Hospital and discovered that G3BP2 is a very potent antigen for use in immunotherapy, a process that is already being used in Queensland to cure melanoma. The results from this team show their technology can elicit a strong attack against cells presenting G3BP2 peptides, such as those in breast cancers, displaying the potential to remove the cancer from the patient. In collaboration with the University of Queensland, the Mater Medical Research Institute and his laboratory at the Institute for Cell and Molecular Therapies at Griffith University, Dr Kennedy will act as scientific advisor of the team that will enter clinical trials for the use of G3BP in immunotherapeutic trials in the 2005-2006 period.

The Heart Foundation Research Centre

Cardiovascular and associated respiratory disorders cause almost half of all premature deaths – far outstripping cancer, infectious disease or accidents – and could profoundly affect community health as Australia's population ages.

Griffith University's Heart Foundation Research Centre (HFRC) tackles the complex field of cardiovascular science on a wide range of interrelated fronts. One of its priority research areas is the impact of aging on heart and lung disease and examining natural compounds and receptors that could help heart cells resist damage. The Centre has identified the A3 adenosine receptor, which may be activated in the body to make the heart resistant to heart attack. Cardiac damage could be prevented by injecting a gene into heart cells to enhance the production of this receptor.

Other innovative research includes examining the cardio-protective mechanisms of an unusual shark that can survive for three hours without oxygen. By studying how the shark's heart cells tolerate such stress, scientists hope to design intervention strategies for mammalian and, eventually, human hearts.

The molecular and cellular effects of macadamia and olive oil are being investigated, as well as cardiovascular, muscular and respiratory responses to exercise training. Diet and exercise, particularly in the elderly, are key aspects of the Centre's research. The crucial variable of gender differences – once a neglected area of clinical/exercise research – is also being examined by the HFRC.

Developing education aids to help reduce coronary artery disease will be a key outcome of the HFRC's work.

The HFRC has state-of-the-art laboratories and it employs more than 40 academic and research staff, collaborates with national and international institutions, and enjoys a strong international reputation.

<http://www.griffith.edu.au>

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