CAREER VIEW

BIOTECHNOLOGY

When the Sumerians brewed beer in 1750 B.C. they knew nothing of yeasts, genes and DNA. Today, using recombinant-DNA techniques, biotechnologists can breed new strains of brewing yeast to improve the quality of beer. For thousands of years people in every part of the world have used the activity of microorganisms to make and preserve food products. In the 21st century the applied science of biotechnology extends to diverse fields such as health and medicine, environmental protection, the creation of alternative fuels, food production, agriculture and all the other primary industries.

Human ingenuity combined with scientific knowledge and commercial savvy continues to produce astonishing results: clothing that changes in response to the wearer's mood, biofuel derived from algae, a nano-magnet that cures cancer by "cooking" cancer cells, self-cleaning glass, vaccines that make possums sterile … the applications of biotechnology are limited only by human imagination and ethical practice.

WHAT IS BIOTECHNOLOGY?

Biotechnology is a wide-ranging and practical field that involves the application of science and technology to living organisms. It is the science of using biological processes for industrial and other purposes. For example through bioremediation, microbes are used to help clean up contaminated environments following an oil spill. This is one of the fastest developing fields of environmental restoration. Microorganisms can also help treat pollutants such as industrial solvents, metals, pesticides, petroleum hydrocarbons and many other chemicals. In agriculture naturally occurring microorganisms (bacteria, fungi) can be used to break down effluent from dairy farms and reduce leaching of excess nitrogen into waterways.

To date New Zealand is particularly strong in large animal, fruit, forage and forestry biotechnology, as well as niche areas of human healthcare. Because biotechnology is a relatively young science there are many opportunities for development. In New Zealand possums destroy vegetation and wildlife. As an alternative to using poison, biotechnologists at Victoria University have developed a vaccine to control the reproduction of possums. The vaccines act as a contraceptive. They make a possum's immune system produce antibodies against its own reproductive proteins, so the reproductive system stops working and the possum cannot have any young. They have also developed a variety of methods for effective delivery of these vaccines to wild possum populations.

Biotechnology has grown exponentially in recent years in both new and traditional biotechnology sectors. An exciting trend is the low cost of genome sequencing. Biotechnology has allowed genome sequencing to cost a fraction of what it used to cost to map the genomes in plants and animals, opening up vast new areas for research and development. Because biotechnology is about developing new products and solutions, there are always fascinating discoveries. For example a Marlborough-based company researched whether sauvignon blanc grape seed extracts could help avoid sunburn. Scientists found that grape seed extracts are excellent at combating protein damage from ultra-violet rays on skin. The high levels of ultra-violet light in Marlborough gave its grapes higher levels of antioxidants and other beneficial chemicals to protect their seeds, which could be added to sunscreen. Biotechnology also finds uses for waste products; the company makes biofuel from grape skins.

Topical coverage of career related issues brought to you by Victoria University Career Development and Employment.

Areas covered include how degrees and courses relate to employment opportunities, to life/work planning, graduate destination information and current issues or material relevant to the employment scene. Your comments and suggestions always welcomed.

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Biotechnology crosses over with biomedical science which investigates the relationship between humans, health and disease. Research includes the study of human genetics, immunology, biological and medicinal chemistry, physiology and environmental health. Health and medicine are fields in which there are many opportunities to apply the inventiveness of biotechnological solutions, whether it is in the applications of stem cell research, diagnostic tests for AIDS or biopharmaceuticals to treat arthritis in animals.

Ethics

People working in the many different fields of biotechnology inevitably face ethical issues. Issues include areas of public concern such as: the role of genetic modification in relation to human health, food safety and consumer choice; environmental issues pertaining to biodiversity, bio-security and the health of ecosystems; economic issues such as the commercial use of research, business development, primary production and exports; taking out patents relating to processes that involve naturally occurring flora and fauna. Degree studies examine the cultural, moral, legal and philosophical issues within the industry and allow students to form a base from which to make ethical decisions.

Commercial and industrial knowledge

Biotechnology is a growing force in the world's economies; in fact some claim that industrial biotechnology is moving economies from being petroleum-based to being bio-based, harnessing natural processes to produce new sources of energy. Knowing the market and the commercial and legal processes of developing, making and selling products is vital for successful entrepreneurship.

WHAT DO GRADUATES NEED TO WORK AS BIOTECHNOLOGISTS?

Graduates need skills and expertise in biotechnology to be able to work in research and industrial biotechnology environments within New Zealand and around the world. It is useful to take biology, chemistry and mathematics at school and to keep up-to-date with areas of interest, as new applications are developing across a broad range of industries. The field of biotechnology is vast and graduates tend to develop specialist knowledge and skills in particular areas. Commerce, marketing, law and related science subjects are particularly useful as minor subjects or conjoint degrees.

WHAT SKILLS DO BIOTECHNOLOGY GRADUATES DEVELOP?

Undergraduate and graduate degrees in science provide excellent grounding for a range of careers. During their degree studies graduates develop both technical and generic transferable skills, attitudes and knowledge that are sought by employers. They develop an appreciation of ethical and cultural issues, work on collaborative tasks and are able to understand and present graphical and other visual data. Additional skills include:

Problem solving: Students solve problems using numerical data and quantitative methods. For example in laboratory work they may identify a problem, formulate a hypothesis and apply scientific method to test their hypothesis. Using observational skills and an eye for detail, they detect when something is not working, use cause and effect reasoning to determine possible causes, and arrive at a solution to the problem.

Analytical: Using analytical skills students evaluate concrete and conceptual information, and draw appropriate conclusions. These skills are useful in many areas of work including research, policy and business roles at all levels of responsibility.

Scientific method: Scientists have to be systematic in designing, researching, setting up and implementing experiments and projects. Degree studies teach skills in scientific process along with a work ethic that demands rigour, safe and responsible practices, tolerance for repetition and patience.

Attention to detail: During experiments and other investigations students develop observational skills and the ability to gather and record detail to a high level of accuracy.

Lateral thinking and creativity: Scientists often have to think outside the square, making new connections and being open to the unknown. Innovative thinking is needed in generating new solutions to human and technological problems and in developing and making new technologies.

Technical: Expertise in the use of computers, software and databases relevant to biotechnology.

Planning/organisation: Laboratory experiments and university assignments require planning and implementation. Learning scientific methodology gives students practical experience in managing and completing projects.

Communication and interpersonal skills: An ability to communicate scientific findings in a clear, concise way to colleagues and to clients with a non-science background is vital in a commercial context. Students develop skills in verbal and written communication through report writing, discussion and making presentations.

Self-motivation: Applied scientific exploration requires staying power and enthusiasm. Developing new technologies can require long hours of exploration, testing hypotheses and detailed repetition as well as the ability to stay tuned to the bigger picture. Science graduates gain experience in managing these different facets of work through their degree studies. Biotechnology is multi-disciplinary and at the cutting edge of commercial and industrial activity globally. Degree studies give a broad base from which to launch into employment, however graduates need to keep up with new developments.

WHERE DO BIOTECHNOLOGY GRADUATES WORK?

Biotechnology graduates have the knowledge and skills to enter a variety of fields. Some examples are genetics, agriculture and horticulture, meat and food processing, pulp and paper, winemaking, bioplastics and biofuels, and the pharmaceutical industry. The pharmaceutical industries are small in New Zealand and there are a few outposts of multi-national companies in the country. Stand-alone research institutes, research laboratories attached to universities and Crown Research Institutes are engaged in research that may use the skills and knowledge of biotechnologists. Product registration and regulation, pharmaceutical and equipment sales, patents and information science are other career options. There are companies throughout New Zealand that employ biotechnologists, wherever there are industries that support biotechnology such as forestry in the central North Island.

Further study toward Master's and PhD degrees may be necessary to advance in research. The Bachelor's degree is a step toward postgraduate qualifications in the above fields and may lead to additional qualifications. Employers may require an MSc for technical support roles. As biotechnology provides a broad scientific training along with commercial and industrial knowledge graduates may also find employment in related fields such as: patents and intellectual property, regulatory bodies, policy, teaching, specialist libraries, science writing and editing, general management and general science. There are also roles in the sales, marketing, administrative and business sides of companies that manufacture and sell the products of scientific research. Some graduates will eventually set up their own companies. Beyond science, management consulting companies are increasingly recognising that scientists with advanced qualifications have been specifically trained to address complex situations, to ask key questions, and then to set about answering those questions.

Research Organisations. Graduates who are passionate about a career as a biotechnologist and who achieve high grades, may head into research within universities, research organisations or companies that have a research function. Scientific research is reliant on funding which affects the availability of jobs and their nature. Work is often in the form of short or long term projects.

There are many exciting, cutting edge projects happening both in New Zealand and overseas. Because the economy of New Zealand is based on primary production there is an emphasis on applied research in agriculture, horticulture, forestry and fishing. This work can have spin-offs for human health as some genes fulfil similar functions in animals, humans and plants. Research on the fertility of possums, for example, can have implications for fertility in humans. Increasingly, New Zealand scientists are making direct and important contributions to drug development and other fields of medical biotechnology.

Most research organisations prefer a Bachelor of Science (BSc) with Honours as a minimum qualification because of the practical laboratory experience the degree provides. Master's and PhD qualifications are vital for more responsible positions. Many laboratories like to encourage future scientists and may offer summer internships or research positions to those intending to do postgraduate study.

Ministry of Science and Innovation. The Ministry of Science and Innovation (MSI) was created in 2011 from merging two other agencies – the Foundation for Research, Science and Technology (FoRST) and the Ministry of Research, Science and Technology (MoRST). The ministry is responsible for the policy, investment and funding functions of both agencies. MSI is part of a broader government focus to boost the research, science and technology (RS&T) sector's contribution to economic growth. It directs knowledge and technology transfer from the RS&T sector to businesses and other research users. The ministry has administrative, policy and advisory roles, some of which require specialist scientific and commercial knowledge and experience.

Crown Research Institutes (CRIs) are government organisations that cover specialist areas of research. CRIs such as AgResearch, Plant and Food Research and Scion (Forestry) employ graduates with a background in biotechnology and related disciplines. Whether it is in the area of fruit genomics, animal and human health, or reproductive technologies there are many, varied opportunities for work and commercial use of scientific intellectual property. A PhD is usually required and CRIs may have studentship positions for students doing higher degrees. Biotechnology is of special interest to New Zealand because of our strong primary industry focused economy. There are opportunities for biotechnology to add value to food safety, biosecurity and our key exports of products such as dairy products, meat, wool and wood.

Government Agencies. The Intellectual Property Office of New Zealand (IPONZ) examines patent claims for new inventions and product designs. They recruit at BSc level and provide training in the legal aspects of the job. Examiners are encouraged to sit the New Zealand patent attorney examinations.

Biotechnology Companies in New Zealand are growing rapidly in number, in areas as diverse as DNA testing, fertility and cancer, brewing beer, waste disposal, treatment of wounds, and the development of some drugs. Some firms have links with international companies and are commercially focused. Small start-up companies often need to be versatile, so double degrees in commerce or law can be useful, along with good communication and interpersonal skills when dealing with clients.

Distributors – sellers of specialist instruments and products often require account managers, sales and marketing representatives with scientific and commercial knowledge to advise clients on equipment and other technology.

Patent Attorneys. Patent attorney firms employ graduates of all levels, although graduates with a Master's or PhD in science or technology are usually preferred. A law degree can be an advantage but in general is secondary to a technical qualification. Most firms will employ science graduates while they complete a law degree part time. Apart from formal qualifications, patent attorneys need very good communication skills, attention to detail, business acumen and analytical skills. Patent attorneys are largely trained on the job. They must pass a series of six qualifying examinations, typically over a period of three or more years. The principal service that a patent attorney offers is the obtaining of intellectual property (IP) rights such as patents and trade marks on behalf of clients, whether established businesses, new start-ups or private individuals. For example, a patent attorney will assess new inventions for patentability, conduct searches for possible infringements or to see if the invention already exists, and prepare and interpret patent specifications. Other services provided may include advice to clients on the management of their intellectual property portfolio, or conducting analysis of the validity of patents or registrations held by third parties. A patent attorney also advises on global IP protection and legal matters associated with IP, such as licence agreements. Pharmaceutical and biotechnology patents form a major part of the workload of any patent attorney firm in both New Zealand and overseas. Vacancies are often advertised on websites as the job market is international and recruitment is on a worldwide basis.

Teaching. Universities are employers of biotechnology graduates interested in a career that combines research and teaching. To fulfil these dual roles universities employ graduates as laboratory technicians, tutors and faculty staff. Graduates considering a career as academic faculty require a PhD and a record of publication to be competitive for junior positions. Often these positions offer the greatest flexibility for a scientist to pursue research that they find most interesting.

Teaching at secondary school level is a viable career option for graduates as biology and general science are taught in secondary schools. Teacher training is required.

Journalism/Science writing and editing for journals, magazines and newspapers is a work option that may require further training. There is a need for writers who have a background in science and can communicate knowledge in a clear and interesting way to a broad cross section of readers.

PROFESSIONAL ORGANISATIONS

The New Zealand Biotechnology Industry Organisation (NZBio) represents the biotechnology sector in New Zealand. It is a member-based organisation that advocates for its members, provides information, creates opportunities for networking and professional development, marketing and business development. The organisation has ethical standards and endorses the view of the Royal Commission on Genetic Modification that New Zealand must proceed with caution in this type of research. Based in Wellington the organisation is active throughout New Zealand. Student members can participate in professional events, network with potential employers and enter a Student Science Poster Award.

JOB TITLES

The following is a sample of job titles relevant to undergraduates through to graduates with post-doctoral degrees and specialisations:

- Biochemist
- Biomedical Technician
- Bioprocess Engineer
- Biotechnologist
- Brewer
- Education/Information Officer
- Fermentation Scientist
- Food Technologist/Engineer
- Geneticist
- Industrial Research Chemist
- Investment Analyst
- Laboratory Technician
- Management Consultant
- Microbiologist
- Medical Science Technician
- Molecular Biologist
- Patents Officer
- Pathologist
- Policy Adviser/Analyst
- Process Engineer (biotechnology or chemical)
- Product Representative/Manager
- Research Analyst
- Research Assistant/Technician
- Research Coordinator
- Research Engineer (biotechnology)
- Sales and/or Marketing Specialist
- Science Journalist
- Science Technician
- Teacher
- University Lecturer

GRADUATE PROFILES

Laura Hubbard

Business Development Analyst
Mining Chemicals Division
Orica, Melbourne

The biotechnology unit in year 13 Biology piqued my interest in the subject and I found it to be even more exhilarating at university. I loved the variety of classes, which included a range of science courses as well as commercial law, business and ethics. Biotech classes not only gave me a thorough understanding of the science behind biological technology, but also taught me a great deal about the social, manufacturing and business implications of the industry.

The core biotechnology classes were a firm favourite from my time at university. In particular being with the same small group right the way through my degree gave my university experience an authenticity I would have most likely missed out on had I taken a more mainstream major. Our visits to local companies and research facilities helped to prepare me for the realities of working in the science industry, while also providing networking opportunities. In third year we were given the opportunity to use some of the university's most advanced equipment, usually reserved for postgraduate students, to successfully splice novel mitochondrial DNA into bacterium - technology which was an especially exciting part of the course.

A highlight for me was being part of a project team which investigated how a new compound created at Victoria University could be introduced into a competitive medical industry. The project management and event planning skills I gained from this course gave me a major advantage in my first year of work and because of this I believe science graduates with an understanding of commercial practices have a distinct advantage in the working world.

The Biotechnology major combined really well with my commerce degree, and I've found that potential employers have been impressed with the combination, especially as biotechnology expertise is so rare. My science degree was a point of differentiation that was pivotal in securing a graduate role in Marketing and Business Development with global mining and chemical company Orica. My employer considers biotechnology to be an emerging field and it has been suggested that I may be able to identify new product

ranges we could launch ahead of our competitors. The chemistry component of my degree has also given me an advantage as I have a technical understanding of the products we sell, unlike many of my colleagues.

I would recommend taking the Biotechnology major if you are interested in more than just detailed science as the graduates from this course are equipped to be industry leaders not simply bench scientists.

Hans Wannemacher

Ramp Operations
Air New Zealand

What to do with your life and what to do after high school, are surely questions we all ask ourselves. I had no idea, but for me going to university was an easy way out. Biology interested me the most in my final year and this is what I was going to do - a Bachelor of Science (BSc).

First-year core science papers were fun. Lecture rooms were filled with 500+ people, and the teaching style of the first-year lecturers kept you engaged amongst the overload of information. Chemistry and biology lab classes were the best of all. You would spend whole mornings or afternoons putting some of the theory into practice and learning how to use the instruments. During this time you also got to know your fellow students and lab helpers very well, which led to more friends and study buddies to help you out on those many assignments.

Funnily enough I found chemistry easier than biology in my first year and I even tried a computer paper - so have a go at whatever sounds interesting. But the passion for biology grew and it wasn't until my second or third year (and after changing to a biomedical science degree, and back to a BSc) that I was set on majoring in Cell and Molecular Biology. The BSc and this major allowed me to combine the many interests I had accumulated as elective papers: biomedical science, pathology, immunology, microbiology, genetics and biotechnology. I would have been at university forever if I hadn't chosen a major.

Other things I enjoyed from my studies at Victoria were the use of real life examples given by the lecturers and the close relationships the university has with experts from organisations such as ESR (Environmental Science and Research), The Malaghan Institute and AgResearch to name a few. Seeing the real life applications of all that textbook stuff was really engaging.

A degree at Victoria can give you many strong skills that you can take into your science career, or any career in fact. To name a few: being organised, research skills, keeping self-motivated and working independently. The most important skills I think are those of paying attention to detail, problem solving and thinking critically. The aptitude for science and many more skills gained at Victoria has allowed me to pursue a career in the forensic sciences. This meant going to the University of Auckland and completing a Postgraduate Diploma in Forensic Science.

For now though I want to travel, so I'm working for Air New Zealand and waiting for my perks to kick in. But I will return one day to hopefully start a career in one of the many options my degrees have given me; in the Police, ESR or New Zealand Fire Service (Fire Safety/Investigation).

Some advice I can give is to try as many elective papers as you can and whatever interests you. Being broad may give you more options later on and set you apart 'from the rest'. Seriously think about post-graduate study. This is really valuable these days, and if you choose to do honours, it's only another year. Once you rush into a job, you will only remember how sweet university life was and want to go back. Don't work too much outside of university as this will only take up valuable study time. Study hard. Get to know your lecturers and lab tutors, they are more than happy to help and give advice, and are awesome people. Oh and finally, get into university life! Hanging out at lunch times in the quad for bands, markets etc., going to gigs at orientation and joining a club. Good luck and have fun!

Gareth Prosser

PhD VUW and Postdoctorate
Auckland Cancer Society
Research Centre

Completing a PhD in Biotechnology was never my intention when I started undergraduate studies in Biomedical Science at Victoria University of Wellington. The name alone was enough to put me off, suggesting a field of study somewhere between cells and cell phones. I was put

in touch, almost by chance, with Dr. David Ackerley, also known as Victoria University biotechnology whizz and head honcho, when I was searching for research projects for my Honours year. I joined his team and quickly found my groove in this new avenue of research - focusing on the discovery and optimisation of bacterial nitroreductase enzymes for anti-cancer gene therapy. I quickly learnt that biotechnology is one of the fastest growing markets worldwide, one that is becoming more and more indispensable in many aspects of human life. The beauty of biotechnology lies in its role of applying fundamental biological research and processes to real world situations. It's all about the science that really matters. From enzymes that can cure cancer to genetically engineered bacteria that can clean up oil spills, the scope of biotechnological research is vast and growing in importance, especially as the world starts to adopt a "greener" image.

Studying biotechnology at Victoria University means learning about key aspects of genetic engineering, enzyme function and other important chemical and biological processes in a manner that is relevant to real life situations. As much of biotechnology research is performed at a practical level, the courses emphasise the acquirement of competence in planning and performing practical (laboratory) experiments and studies. For me, the hands-on aspect of lab work is without a doubt the most interesting and exciting part of biotechnology research, as not only does it put you at the cutting edge of scientific discovery and progress, but it also lets you exercise creativity and provides experience in independent thought and teamwork, essential attributes for success in any career. Studying biotechnology also nurtures communication and writing skills, as sharing of research ideas and results within the wider scientific community is vital to the functioning and progress of biotechnology.

To students who are interested in studying biotechnology, I'd say - give it a go. The theoretical aspects of it may be rather daunting, even boring at first, but the ability to apply this knowledge practically is where the real attraction of biotechnology lies. Continuing study to postgraduate level is nowadays almost a prerequisite for any entry level job in biotechnological research, but should not be a deterrent as postgraduate study provides direct work experience and the opportunity to undertake real, meaningful research under the supervision of experienced scientists. Then of course there is the added perk of university-funded international conference trips…

Hannah Pearce

Research Assistant
Baker IDI Heart and Diabetes Institute, Melbourne

I was always fascinated by the inner workings of the natural world and from my early years at high school wanted to "do science". I liked the idea of using science to create something new and to apply it, and enrolled in a BSc majoring in Cell and Molecular Bioscience and Physics. In my first semester at university I took BTEC 101 as an interest paper and realised that this was really the course I had been looking for. I switched to the Biotechnology major and never looked back.

I enjoyed learning about how things worked at a molecular level, how these things are actually studied, and the ways in which they could be modified and utilised. I realised that biotechnology was actually quite a creative science with endless possibilities. I also enjoyed learning about the industry and business side of things – I hadn't expected this but it's hard not to with such an exciting industry!

My Biotechnology degree gave me a broad yet in-depth grounding in the concepts of biotechnology and some laboratory experience, but I realised that it would be significantly stronger with more hands on experience. I did a summer studentship in a lab in Australia and then returned to Victoria University Wellington to do Honours. The Honours year was demanding, but an incredibly worthwhile experience during which I did a supervised research project in a laboratory and gained valuable research skills. Afterwards I stayed in the lab and did a summer project.

Many people warned me that a job would be difficult to find, especially in a recession, however I actually found my current job quite quickly. I think the biotechnology major helped a lot in this regard as biotechnology is essentially a set of tools and concepts that can be applied to multiple biological areas, and thus is a widely applicable degree. Having acquired a wide range of laboratory and research skills also helped, not only in acquiring the job, but also in doing it. The concepts I learnt during my degree are also an essential grounding for the research I am doing now.

BIOTECHNOLOGY AT VICTORIA

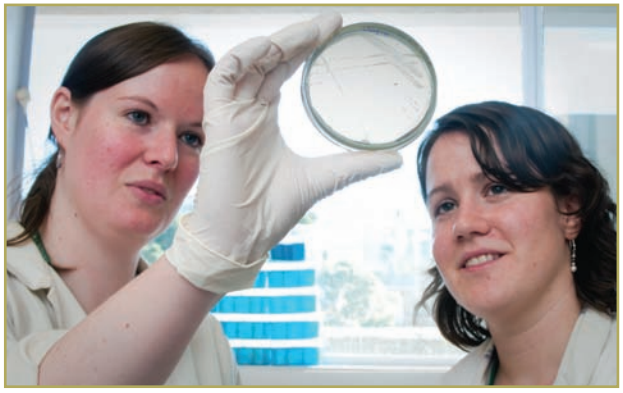
The Bachelor of Science (BSc) major in Biotechnology at Victoria is a three-year degree that provides grounding in biotechnology and its underlying biological and chemical sciences.

Biotechnology is the application of science and technology to living organisms. It uses biological systems, living organisms or their derivatives to make or modify products or processes in a wide-range of fields such as medicine, food and beverage, cosmetics and even clothing. Consequently, students will study a mixture of biotechnology, cell biology, chemistry, genetics and molecular biology, commercial law, ethics and technology development. Biotechnology is part of daily life and is multi-disciplinary. While it has been used for decades - to provide insulin for diabetics, for example - its potential is only just being realised by the public.

The staff who teach in Victoria's Biotechnology programmes also undertake research. For example one programme has been investigating the development of new diagnostics for egg quality or ovarian cancer and reagents to manage fertility in humans, livestock, endangered wildlife and pest species. Particular research interests focus on the kakapo, an endangered native parrot, and the possum, an important pest in New Zealand.

Students can specialise in areas such as bioactives and biodiscovery, protein and nucleic acid biotechnology, and bioprocessing and microbial biotechnology. As well as a sound scientific education, students consider cultural and ethical issues, and are introduced to the aspects of commercial law and technology transfer involved in bringing biotechnological developments to the marketplace.

Collaborative links to Wellington-based research institutions such as Crown Research Institutes (CRIs), see many students conducting their research projects in



conjunction with scientists at the CRIs, or employed there as summer interns.

The diversity of the biotechnology sector is vast, ranging from research organisations undertaking controlled genetic manipulations in the laboratory to those looking to obtain high value products from natural resources.

Victoria's biotechnology students have the opportunity to work at a technical level within a laboratory or industrial setting. They graduate with scientific, ethical and business skills, ready to enter booming scientific fields such as: biomedical industries and research, biotechnological industries, environmental monitoring and/or risk assessment, intellectual property, pharmaceuticals, scientific computing and scientific journalism. A conjoint BSc/BCA (Bachelor of Commerce and Administration) degree with a BSc major in Biotechnology is particularly appropriate for graduates applying biotechnology in the business sector. Economics and Accounting papers are of particular relevance here. Graduates may do further study in a BSc(Hons) and Master's of Biotechnology and go on to PhD level.

The BSc in Biotechnology is structured so that you may include courses from any other first degree at Victoria. To enrol in a Biotechnology BSc you will need a university entrance qualification. It is useful to have studied chemistry, biology and mathematics. A summer bridging course is available for students without the necessary chemistry background.

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