

### Molecular Basis of Health and Disease

It was when Waruna Weeraskera's mother encouraged him to attend a University of Otago student fair in Colombo, Sri Lanka that he discovered the Biomedical Science programme.

After that initial contact Waruna did some investigating and decided that the freedom of the Biomedical Science programme would allow him to study what he wanted.

In his first year of university, Waruna studied a general science course including psychology and physiology. Physiology proved to be his favourite subject, further cementing his interest in the Biomedical Science programme. He combined his physiology study with biochemistry, meeting the requirements for the Molecular Basis of Health and Disease major. Within this major he would gain a deeper understanding about how the body works in health and disease.

Waruna had decided from the beginning of his study that he wanted a qualification that would give him employment opportunities, but that would not compromise his areas of interest. Waruna now works as a Teaching Fellow at the University of Otago and teaches in laboratories for first and second year physiology students.

"I don't feel like I'm studying because it is my interest. I just feel like I am finding out about the things I want to know," says Waruna of his physiology study. He found that he had "a strange affinity to the subject. It was fascinating to learn about ourselves."

Experiments were a large component of this programme and a part that Waruna particularly enjoyed. "Being able to replicate a scientific approach and develop your own skills for the experiment," helped make his study relevant.

Better understanding of cardiovascular and renal physiology is what Waruna would like to pursue now. Who knows, his research may discover world-breaking news.



### Nutrition and Metabolism in Human Health

Philippa-Jane Simpson spent her first year at Otago as a Health Sciences First Year student intending to study Pharmacy. In her second year she enrolled in a BSc majoring in physiology and human nutrition. At the end of her third year she graduated with a Bachelor of Biomedical Sciences in Nutrition and Metabolism in Human Health. Despite the changes in her study, none of her papers were wasted and all counted towards her degree, including her one marketing paper.

It was the "room for flexibility when choosing your papers" and the multidisciplinary nature of the degree that suited Philippa-Jane perfectly. "The links between what you eat and how your body responds really interested me. We studied things like micronutrient supplementation programmes in Africa, and heart disease and cancer in New Zealand – the issues are very real."

Philippa-Jane's background and mix of subjects landed her an ideal job with Nutra-Life Health and Fitness in Auckland.

For the first six months she was working in the lab developing nutritional sports powders and ensuring that the products complied with set guidelines and were up to standard for release. Now, as well as using her biomedical science knowledge, she uses her marketing skills and works in a marketing role as Product Manager, overseeing a portfolio of products.

"The technical background is definitely useful – knowing the finer detail of how and why the products work. This makes it easier to market the products and means I can communicate about them more effectively."



For questions about Biomedical Science  
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### Reproduction, Genetics and Development\*

Helen Martyn has always had an interest in science and studied the sciences available to her at her secondary school in Westport. Her love of science strengthened while at school and so she enrolled in Health Sciences First Year in order to experience a wide-range of the sciences before making a final choice on her pathway. "Health Sciences First Year is a good programme because you can try everything."

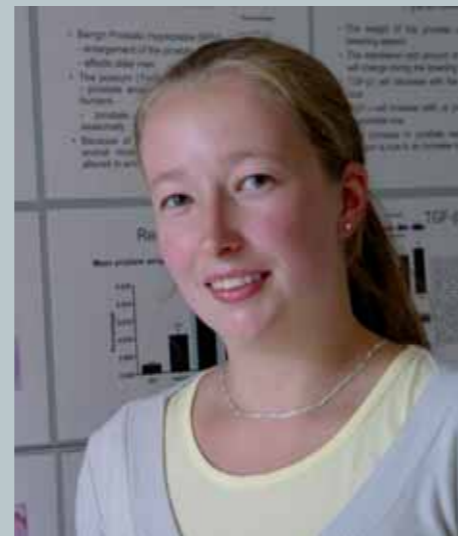
After Health Sciences First Year she studied Anatomy & Structural Biology as well as Physiology intending to double major. During her second year she found the Reproductive and Developmental Biology paper stimulating and interesting as "it was totally new from anything at high school and it all seemed so relevant" and so decided to pursue a degree in Biomedical Sciences majoring in Human Reproduction and Development (now replaced with Reproduction, Genetics and Development).

There were many aspects within the Biomedical Sciences programme that were enjoyable; "having lots of labs was really good" and "actually doing the experiments yourself was cool" as it made learning and doing assignments seem very relevant and easy to complete.

Helen has now graduated with an honours degree in Biomedical Sciences. "The honours year is a big plus because you research for the whole year. So if you are a scientist who wants hands on experience to discover by yourself for yourself then this is the programme for you."

Where to now for Helen? – She is going to use her degree to either begin her study of medicine or begin her PhD and continue with her own research.

\*This major replaces Human Reproduction and Development.



# biomedical sciences

The Web of Life



Biomedical sciences is the degree that links the papers relevant to an understanding of the scientific basis of health and disease in humans. You can combine papers from two or more disciplines into one of six exciting and innovative majors – the 'web' that underpins biological and medical research. The degree aims to provide graduates with the skills required to meet the constantly changing boundaries of modern biosciences.

*"The University of Otago's Biomedical Science course has kick-started my future in research science. It provided an excellent grounding in the methods, new ideas and hot topics at the forefront of medical research science world-wide"*

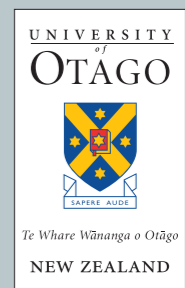
Mark Robinson BBiomedSci (Hons) 2006

 **biomedical science**  
The Web of Life

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## Biomedical Sciences at Otago

The University of Otago is acknowledged as a world leader in biomedical sciences. The diverse departments that contribute papers to this degree are able to provide training across the whole spectrum of biomedical sciences – there is no narrow focus or restricted choice here! A common first year ensures that BBiomedSc students are well-grounded in the basic sciences that underpin the later years of the degree. A BBiomedSc degree at Otago allows you to benefit from the University of Otago's research excellence and unique campus lifestyle.

### Why Study Biomedical Sciences?

Biomedical sciences is the interdisciplinary approach to sciences. It has great name recognition and is a very marketable degree. With its focus on inter-disciplinary studies, a BBiomedSc degree produces graduates who are well-positioned to take advantage of one of the world's fastest-growing job markets – biotechnology. Our students are fast-gaining a reputation for excellence and are sought after for PhD studies, so this is a good option if you are interested in a research career. A BBiomedSc also provides an excellent grounding for those students who wish to apply for graduate-entry to health professional programmes such as medicine, dentistry, pharmacy or physiotherapy.

### Background Required

The BBiomedSc degree has a common first year and all students must take 7 papers including BIOC 192, CELS 191, CHEM 191, HUBS 191, HUBS 192 and PHSI 191. There are no particular requirements for entry to these first year papers, although a school background in biology, chemistry and physics is strongly recommended.

Most BBiomedSc students enrol in the Health Sciences First Year (HSFY) programme and would take HEAL 192 as their seventh paper. However HEAL 192 is not compulsory for BBiomedSc and may be replaced with another paper that may be chosen from any degree schedule.

In order to progress to the second year of the BBiomedSc degree, students must pass all 7 papers (126 points).

### What majors are available?

Currently there are six majors available in BBiomedSc. These are Drugs and Human Health (DRHH), Functional Human Biology (FUHB), Infection and Immunity (INIM), Molecular Basis of Health and Disease (MBHD), Nutrition and Metabolism in Human Health (NMHH), and Reproduction, Genetics and Development (REGD).

## Drugs and Human Health

The use and abuse of drugs plays a major role in human health. Drug use is increasing with the ageing of the population and with its increasing affluence. As drug use increases, the search for new agents has widened from traditional sources such as plants and animals, to new sources utilising new technologies in pharmacology, biochemistry, and immunology. This major gives an overview of the role of drugs in human health.

### Functional Human Biology

Ultimately, human health depends on the normal functioning of the cells, tissues and organ systems of the body. Understanding of disease in turn rests upon knowledge of the pathological processes on these systems. This major provides an overview of the mechanisms of functioning of all systems of the human body and explores specific areas in depth, with a research-informed focus.

### Infection and Immunity

The study of microbes responsible for infectious diseases and their control is an important area in biomedical sciences. Infectious or microbial diseases important in New Zealand include invasive meningococcal disease, tuberculosis, rheumatic heart disease and AIDS. Topics include the characteristics and properties of pathogenic microbes, antibiotic resistance, and immunology and its relevance to the prevention and control of microbial and other diseases, such as cancer.

### Molecular Basis of Health and Disease

This major explores the molecular basis of human metabolism and investigates the genetic and biochemical aspects of human health and disease. Some of the topics covered include mechanisms of gene regulation, identifying gene defects and their effect on biochemical pathways, and the expression of disease phenotypes.

### Nutrition and Metabolism in Human Health

This major covers the essentials of the physiology and biochemistry of nutrition, dietary assessment, and nutrition and its relevance to human health. Topics covered include protein and amino acid requirements and nutritional issues, assessment of nutrient status, energy requirements and balance, the role of lipids and carbohydrates in metabolic disorders.

### Reproduction, Genetics and Development

This major focusses on understanding the interplay between genes and structure in reproductive and developmental processes. It explores sub-cellular structures and genetic organization, through to the study of the gross anatomy of the reproductive systems, and the processes by which a fertilised egg is transformed into a whole organism. Subjects covered include the basic biology of reproductive systems, formation of embryos, genetic control of developmental processes, transgenic plants and animals, and a range of anatomical and molecular genetic techniques.

### What is the difference between a BBiomedSc and a BSc?

All the papers in the BBiomedSc degree are also available in the BSc programme – the main difference is the way the degrees are structured. All BBiomedSc students have 6 papers in common in their first year, and must pass 126 points (or 7 papers) before continuing into second year. In the third year of study, a BSc student must take 4 papers in their chosen discipline whereas a BBiomedSc student must combine 2-3 papers in one discipline with 1-2 papers from another discipline. So a BSc is discipline-focussed whereas a BBiomedSc is inter-disciplinary. In addition, the BBiomedSc degree is focussed on human health and disease.

### Can I change degrees or majors?

YES! As the papers are the same in both degrees it is possible to change from one degree to the other at the end of second year, providing you have met the appropriate prerequisites for your chosen major. In fact, we like you to keep your options open as long as possible!

### Career Opportunities

As a graduate of Otago's BBiomedSc degree you will have a wide variety of career options, both in New Zealand and overseas. You might choose to use this degree to apply for graduate entry to medicine or other health science professional programmes, or to continue research-based training in one of Otago's internationally acclaimed biomedical departments.

Your working life might begin with one of the new innovative biotechnology companies or with a more established company in the pharmaceutical, biomedical or agricultural sectors. Alternatively, you might be employed by a research institute, university, government agency, or local authority, and use the scientific skills you have learned during your studies to provide policy, technical or diagnostic advice.

Some of our graduates are now studying medicine, dentistry, optometry and forensics. Some have opted for a research career – the BBiomedSc Honours programme is a one-year postgraduate degree and graduates from this programme are sought after as PhD students. BBiomedSc graduates are working as teaching fellows, research assistants, and product managers.

# profiles

## Drugs and Human Health

During her secondary schooling in Malaysia **Wann Shiuan Loh** was interested in the sciences, especially biology. "I knew I wanted to be a part of health sciences since high school," she says. This led her onto investigating biomedical sciences and discovering that "Otago has a very high reputation in medical science". So as soon as she graduated from high school Wann Shiuan came to Dunedin to study at the University of Otago.

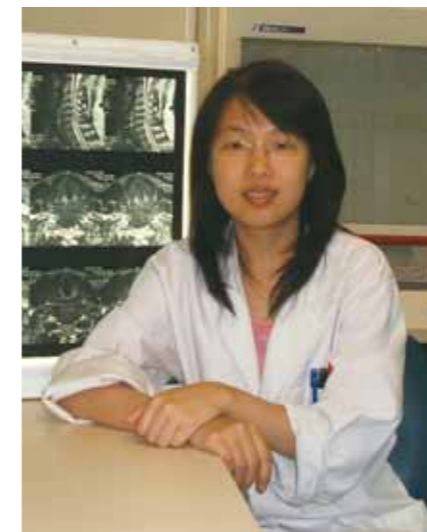
As an international student Wann Shiuan found the support available at Otago helpful and so she became an international mentor during her third year, helping first year international students start their new lives in Dunedin.

Wann Shiuan chose the Biomedical Sciences programme because it gave her a sound background in health sciences before she actually decided which area she wanted to specialise in. She decided to major in Drugs and Human Health "because it is more pharmacological related which really appealed to me", she explains.

As many Biomedical students find, the variety of papers is one of the things that is most enjoyable. Wann Shiuan studied papers including pharmacology, physiology, biochemistry and pathology. While the range of papers makes the study a challenge it also ensures that it is always interesting.

Wann Shiuan has now graduated with a Bachelor of Biomedical Science majoring in Drugs and Human Health and is working on investigating the structure of the pharynx using MRI images and micro-CT scans.

Now that she has had the experience of hands on work in her area of speciality, Wann Shiuan is looking to further her education by beginning postgraduate study which she says will improve her analytical and critical thinking skills.



## Functional Human Biology

For **Thomas Clendon** variety has always been an important part of his study and a degree in Biomedical Sciences allowed him exactly the flexibility he wanted.

While at school Thomas had a definite interest in the sciences, but also continued with study in English and history. Once at university, the variety of the Health Sciences First Year programme, coupled with the ease of enrolling in a set programme suited Thomas well and gave him the opportunity to discover exactly what he enjoyed.

In his second year of university study Thomas entered into the Biomedical Science programme. "The programme had variety and allowed me to keep my options open," which was appealing to Thomas who studied physiology, biochemistry and anatomy, but also had some room for history and politics.

Thomas majored in Functional Human Biology after a real interest was sparked in physiology, where he enjoyed studying "how the body works and how all the body systems work together." Thomas calls it "the real world science."

During his third year of study the increased laboratory orientated work was of real interest to Thomas, where he not only "completed the experiment, but in some instances had to decide on the experimental process to be undertaken." "It was great way to really understand what you were doing and why."

Having graduated with a Bachelor of Biomedical Science in Functional Human Biology, Thomas was successful in gaining entry into medicine. "It is a great help to have completed a degree before undertaking medicine. The three years of Biomedical Science study have been fundamental to my medicine studies."



## Infection and Immunity

**Mark Robinson** has always been interested in diseases and how the body fights them.

A degree in Biomedical Science has paved the way for him to pursue his interest. Mark came to Dunedin from Whangarei for his university studies. He had heard that "Dunedin was a great city for students and that the University of Otago offered fantastic courses." Mark certainly has not been disappointed and has enjoyed both the student lifestyle and the study that is offered at Otago.

While at school, Mark had always thought about biomedical research and he began his university study with Health Sciences First Year. "It was a good introduction to all the sciences and was good grounding if I did change my mind." However, he didn't change his mind and began his study in biomedical science.

Mark's interest in diseases and vaccines directed him into the Infection and Immunity major where he was able to study bacteria and viruses and how the body reacts to infection.

"One of the great things about the biomedical science programme is the flexibility of your study. I was able to study a broad range of topics in a wide range of departments - Microbiology and Immunology, Biochemistry, Pathology, Anatomy and Physiology."

Mark also completed the honours year, which he believes is "a really good programme as it allows you to begin researching." Researching has led Mark right through to PhD study. After which, he wants to continue with his research career "and discover new things in either an academic or commercial field."

With a biomedical science qualification, "I have a real diverse background on a whole range of topics and it has set me up to do anything I want to do in science."

