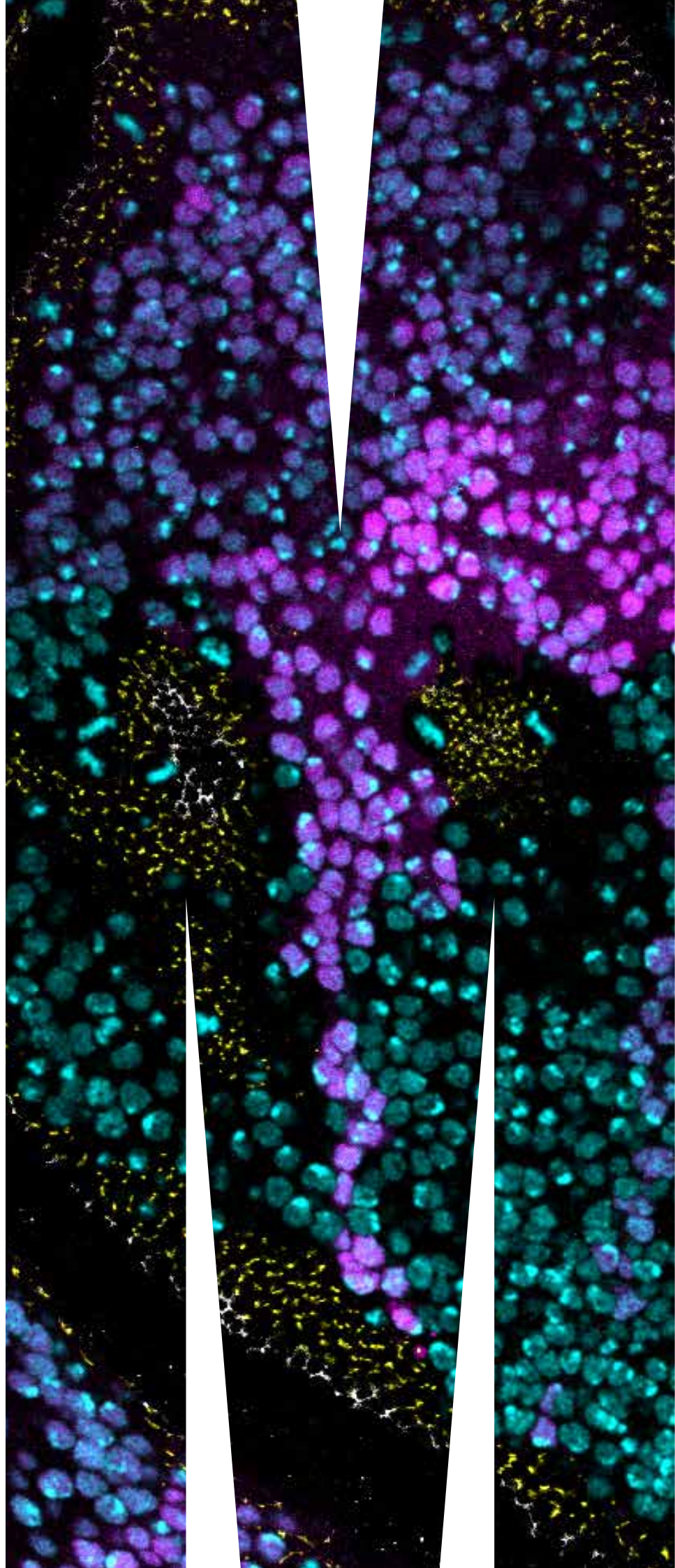




MONASH
University

BIOMEDICAL SCIENCE STUDY AREAS

monash.edu/discovery-institute





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*The cover image was supplied courtesy of Monash Micro Imaging.

Kidney Reef[†] : Whole mount staining of the Ureteric epithelium (E-Cadherin) of a mouse embryonic kidney displaying one growing cyst.

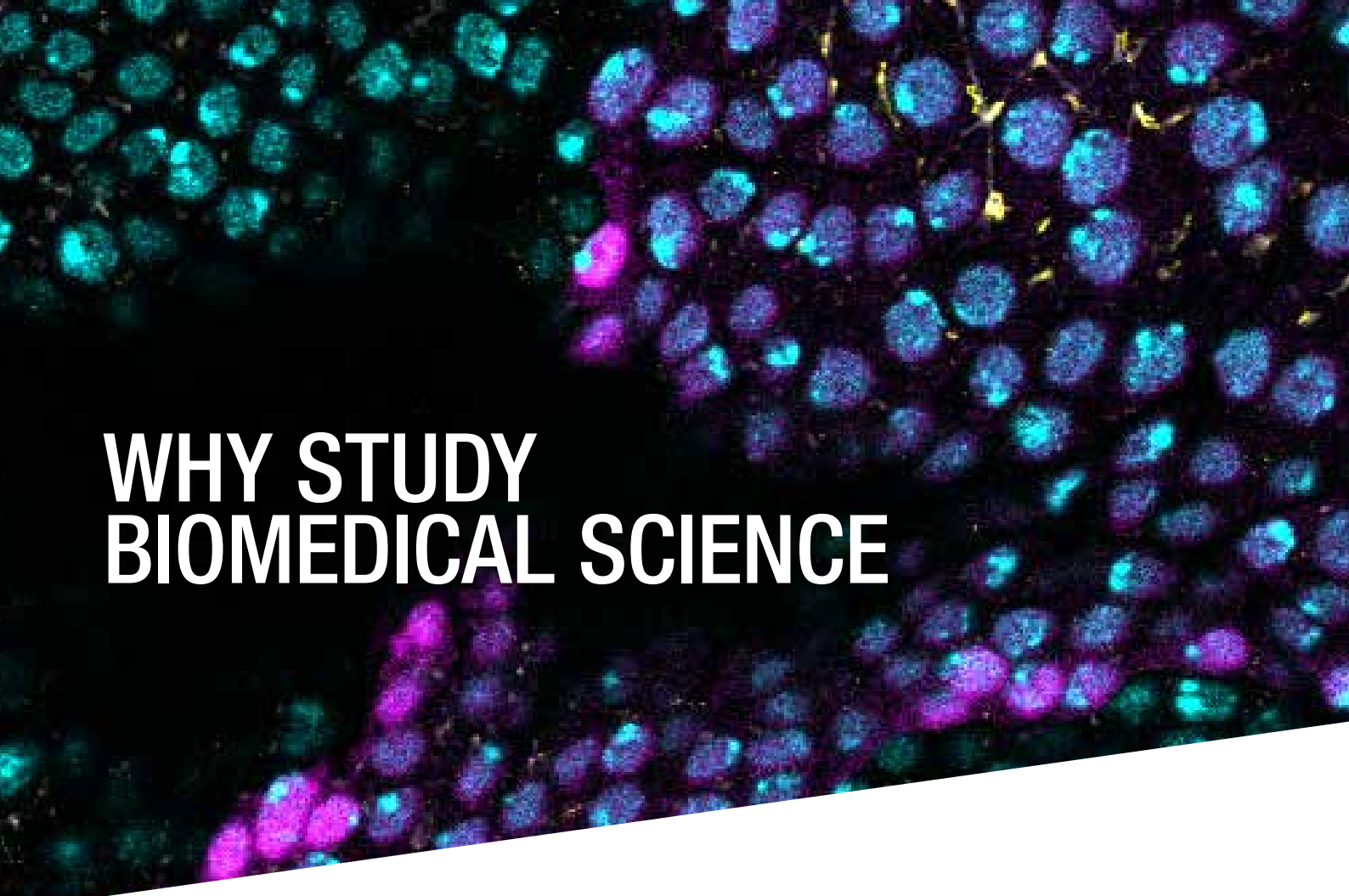
Julie Moreau, Dept Anatomy and Developmental Biology, Biomedicine Discovery Institute, Monash University, Clayton.

Acknowledgement

We acknowledge the traditional lands of Indigenous peoples.

The Faculty incorporates the Aboriginal and Torres Strait Islander Curriculum Framework in educating future health professionals. You will learn skills in respect, communication, safety and quality, advocacy and reflection to improve Indigenous health.

Monash is committed to facilitating the entry of Indigenous students into courses. There are a range of pathways, entry points, bursaries, scholarships, accommodation, tutorial support and cadetships. To learn more about entry requirements and our Indigenous Access Interview, contact Gukwonderuk Indigenous Health staff via email at med.indigenousealth@monash.edu or 03 9905 3828.



WHY STUDY BIOMEDICAL SCIENCE

Interested in using science to make a difference to human health? Studying biomedical science equips you with the knowledge and skills to tackle today's most critical issues in healthcare and disease.

WHAT IS BIOMEDICAL SCIENCE?

Biomedical science is the study of organs, tissues and cells, as well as the complex processes that occur to allow humans to function and develop normally. During your degree you will learn how disruption of these processes can lead to disease, and you'll gain an understanding of how this knowledge fits into the big picture of human health.

HOW CAN I STUDY BIOMEDICAL SCIENCE?

There are three ways you can study biomedical science at Monash:

BACHELOR OF BIOMEDICAL SCIENCE

In this course you'll begin studies in biomedical science from day one. This includes a range of biomedical units that explore all areas of human health and disease. There are 14 core subjects that are all interconnected and form a solid foundation for your future career.

BACHELOR OF SCIENCE

You can specialise from second year to focus on one or two biomedical science areas. This degree will let you choose a major area of study and graduate with in depth expertise in that field.

DOUBLE DEGREES

The Bachelor of Biomedical Science can be combined as a double degree with:

- Commerce
- Engineering(Honours)
- Law (Honours)
- Science

For more information about courses at Monash - visit find a course
<https://www.monash.edu/study>.

WHAT ARE MY CAREER POSSIBILITIES?

You'll develop the skills and knowledge that will help you to make a difference to human health through a wide range of career paths. When you finish your undergraduate course, some of the options available to you include entering the workforce through a graduate job, progressing to a research-based Honours year or completing postgraduate study that will qualify you for a health profession.

Career opportunities that biomedical science graduates can pursue include (but are not limited to):

- Bioinformatician
- Biotechnologist
- Clinical researcher
- Clinical trials manager
- Educator
- Food scientist
- Forensic scientist
- Pharmaceutical sales and marketing
- Public health advisor
- Reproductive scientist
- Researcher
- Science writer
- Strategy consultant

Biomedical science at Monash also gives you great preparation for graduate medicine and future careers in medical research.

GRADUATE MEDICINE

When you complete the Monash Bachelor of Biomedical Science, Bachelor of Science (with specified subjects completed) or double degrees you will be eligible for up to 75 places within the Graduate Entry Doctor of Medicine course.

For more information, please visit

<https://www.monash.edu/study/courses/find-a-course/2022/medical-science-and-medicine-m6018>

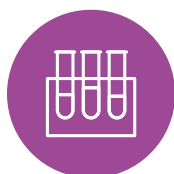
BIOMEDICAL SCIENCE

AREAS OF STUDY

Biomedical science is taught through the Faculty of Medicine, Nursing and Health Sciences, across the Monash Biomedicine Discovery Institute and the Central Clinical School.

Biomedical science is an interdisciplinary field that combines biology and medicine in order to understand and improve the health of humans. The biomedical science areas of study examine how the body works in health and in disease, and will be the key to advances in medical treatments and human health in this century.

AREAS OF STUDY IN BIOMEDICAL SCIENCE



BIOCHEMISTRY



DEVELOPMENTAL
BIOLOGY



HUMAN PATHOLOGY



IMMUNOLOGY



MICROBIOLOGY



PHARMACOLOGY



PHYSIOLOGY

For more information, please visit monash.edu/pubs/handbooks/aos

BIOCHEMISTRY

Biochemistry deals with the chemical components and genetic material of living cells, allowing us to understand the molecular events that underlie biological processes. Biochemistry draws on biology, chemistry and physics, providing a key interface between these fields. By understanding biological systems at the molecular level, biochemists are able to interpret the activities of living cells.

Why should I study biochemistry?

Biochemistry expands our understanding of the causes of disease and provides a basis for the development of effective treatments. Biochemical knowledge has many applications in research and technology, and is sought after in diverse fields, from forensic science to agriculture and plant biology.

What will I learn about?

- Structure and function of cellular biomolecules
- Genes and their expression, regulation technology and applications
- Metabolic basis of human diseases
- Cellular signal transduction and its role in cancer and disease
- Protein biology from sequence to structure and disease

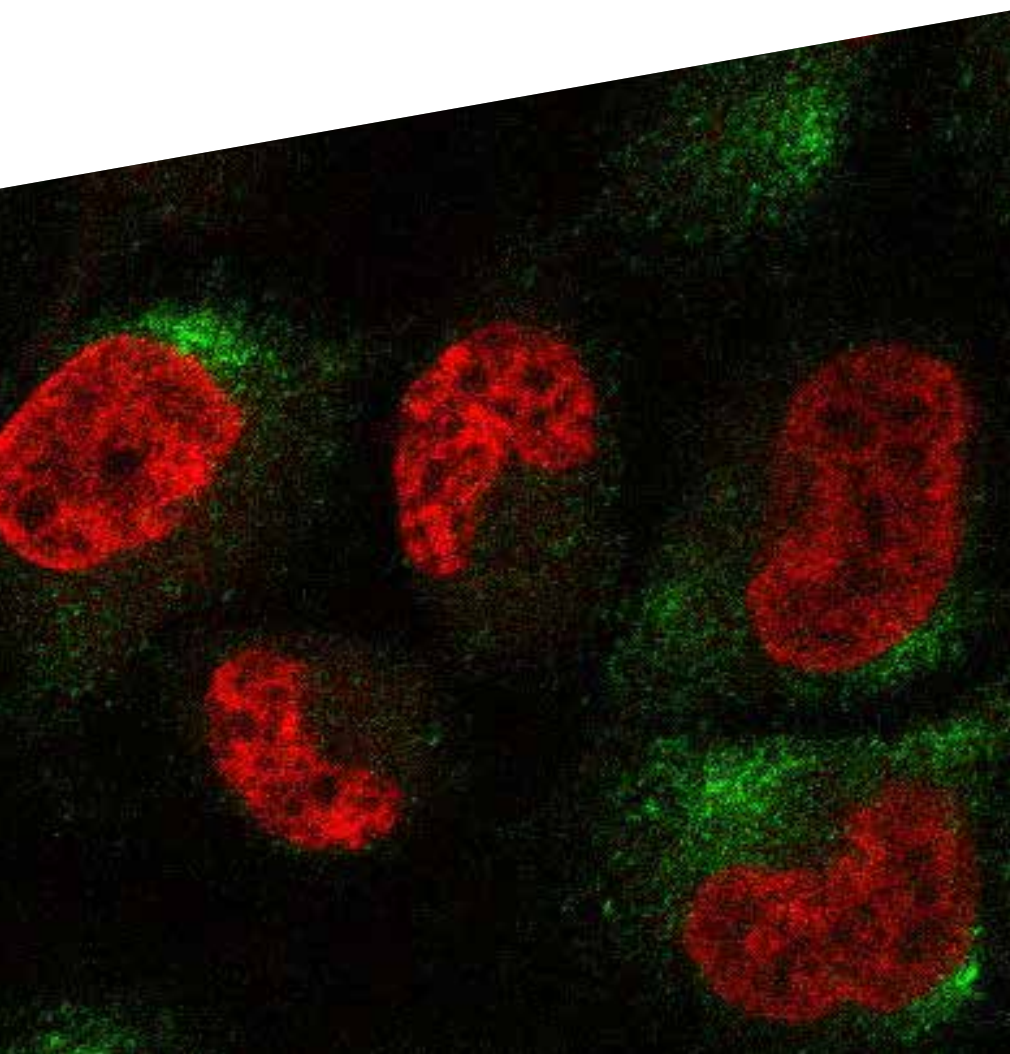


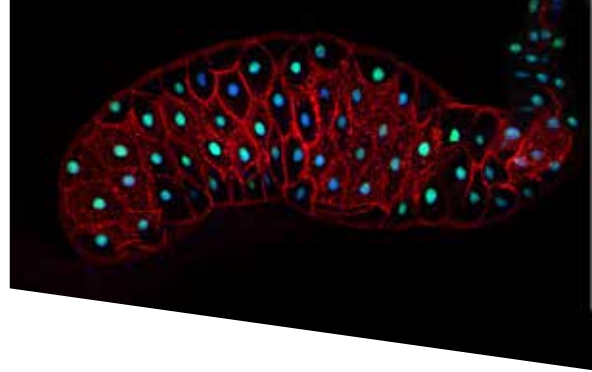
I have always enjoyed science and through completing my major in biochemistry I have developed an understanding of molecular cell biology, cell signalling, cancer, genomics and therapy. I have really enjoyed studying the biological and molecular pathways, and particularly understanding what happens when these systems do not work properly and lead to disease. If this sounds interesting, then biochemistry is for you!

JIANSHEN LAO

Honours

Area of study: Biochemistry





DEVELOPMENTAL BIOLOGY

Developmental biology explores the development of an adult organism from a single cell. This area of study covers such topics as human development, birth defects, stem cells, and regenerative biology and medicine. You'll examine the human anatomy and its relevance to health and disease.

Why should I study developmental biology?

Understanding the biological development of humans will equip you to tackle many of the current challenges in modern biomedical science, such as tissue engineering, stem cell bioethics and how abnormalities in genetic and environmental regulation lead to birth defects and adult disease. By studying developmental biology at Monash, you'll be joining an internationally recognised department that has conducted world-renowned research on stem cells, reproductive biology and *in vitro* fertilisation.

What will I learn about?

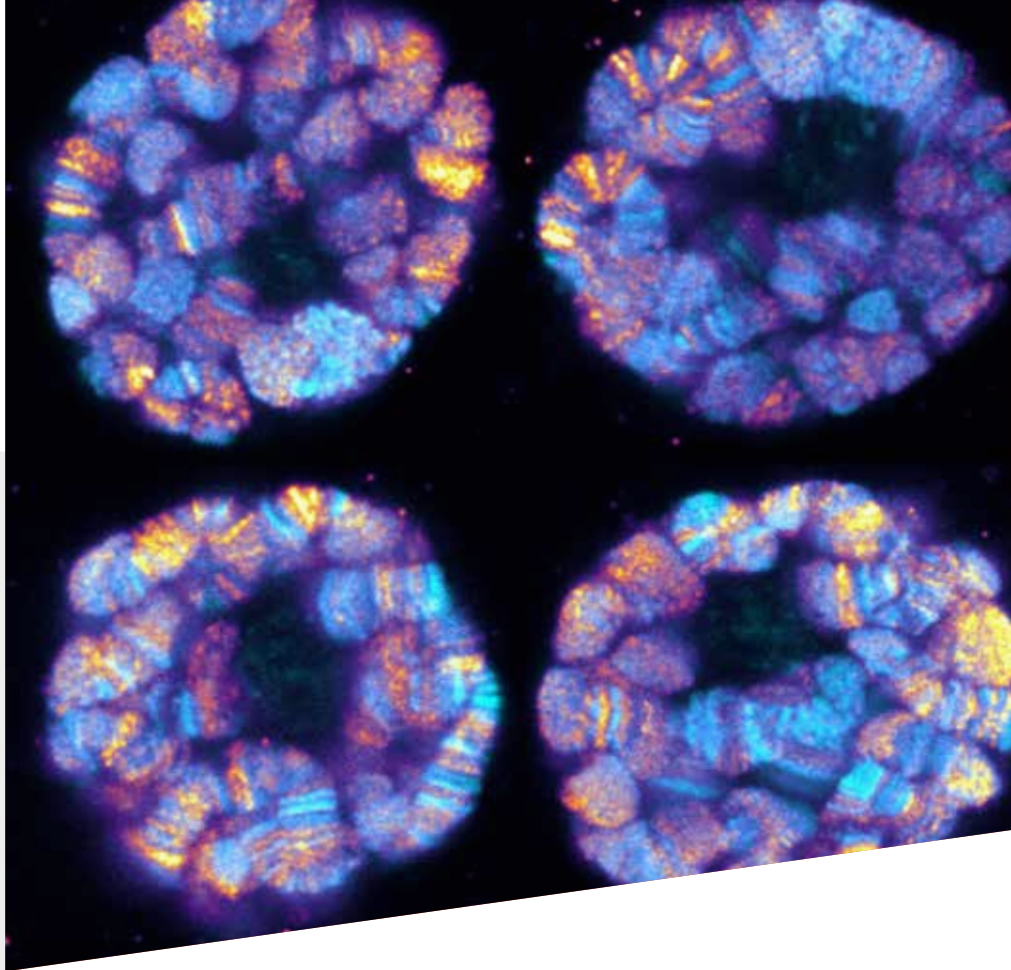
- Early human development from cells to tissues
- Developmental and anatomical basis of human health and disease
- Fetal and neonatal development
- Stem cells and the foundations of life
- General anatomical structure of the human body and selected body systems
- Anatomical terminology and principles

I have always had a passion for biology, with a keen interest in reproduction and fertility in particular. I like how Developmental Biology has taught me not just the fundamental concepts - such as how organs, body systems and whole organisms are formed during embryonic development - but also the molecular mechanisms that underpin these processes. Majoring in Developmental Biology also exposed me to the amazing current research at Monash, as well as the experimental designs and techniques commonly used. This inspired me to undertake an honours year and continue onto a PhD at the Biomedicine Discovery Institute, where I'm now looking at developing fertility preservation strategies to protect the ovary from chemotherapy-induced damage.

LAUREN ALESI

Bachelor of Science (Honours)
Area of study: Developmental Biology





Through studying human pathology, I have enjoyed discovering the underlying reasons of how diseases occur in the body and how we can overcome them with science. I have undertaken research in two labs that focused on investigating oligodendrocytes (myelinating cells of the central nervous system) in models of multiple sclerosis (MS) and paediatric brain injury. The research is really interesting and I believe that studying Human Pathology can equip future students with the fundamental knowledge of how different diseases affect the body which can lead to finding solutions to better disease management.

SAL BOZKURT

Bachelor of Science

Area of study: Human Pathology

HUMAN PATHOLOGY

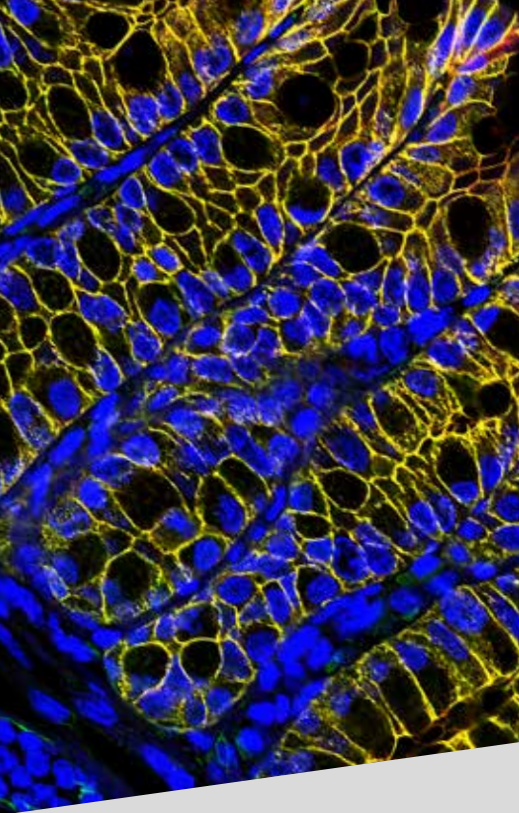
Human pathology is the study of disease processes, including disorders of immunity and neoplasia, inflammation and cell death. This area of study examines how the body responds to disruption of normal tissue structure and function by injurious agents. You'll learn how the cause of a disease (such as a gene mutation or external injury) leads to cellular and tissue abnormalities, which result in clinical symptoms.

Why should I study human pathology?

The study of human pathology is fundamental for medical research or clinical and laboratory medicine. You'll develop a comprehensive understanding of how organ systems fail during disease and injury, which is critical for diagnosis, prognosis and therapeutic intervention. Human pathology involves examining disease in a multidisciplinary manner, giving you opportunities to apply your knowledge of other biomedical sciences, and to gain the basic tools of diagnosis of disease in a patient.

What will I learn about?

- Understanding disease processes
- Pathology of human diseases
- Clinical immunopathology
- Neuropathology
- Pathological processes such as necrosis, cell injury, ischaemia
- Causes and outcomes of disease



IMMUNOLOGY

Immunology is the study of the immune system in health and disease. The immune system is crucial for our survival, as it protects us from infectious diseases caused by bacteria, viruses, fungi or parasites. It is the reason why we recover from a cold but also why we suffer from allergies, have autoimmune diseases such as type I diabetes, and why we reject tissue transplants without medication.

Why should I study immunology?

Immunology is the basis of many health issues in our society, including infectious diseases, cancer, allergies and autoimmunity. Knowledge of immunology enables progress in these areas. Choosing to study immunology will provide you with a foundation for understanding many aspects of human disease. There is emerging evidence that links immunity to areas of health such as diet, mental health and cardiovascular disease. It is a field filled with new and exciting discoveries and applications, such as investigating how we can manipulate the immune system to provide better health to individuals.

What will I learn about?

- Immunology in health and disease
- Molecular and cellular immunology
- Clinical immunopathology
- Principles of applied immunology
- Clinical and research laboratory immunology



I've always liked biological sciences but the scale of immunology is impressive - the breadth of the immune system is just so vast that it affects every part of the body. It's fascinating to uncover the underlying mechanisms of how the immune system combats disease. This field is in continuous growth with many opportunities to discover something novel. The immunology staff at Monash are great educators and always enthusiastic about their research.

KRISTIAN BARRY

PHD

Area of study: Immunology

I have always been interested in the complexities of human disease and fascinated by the impact microorganisms can have on us. Studying Microbiology has allowed me to learn about clinically important pathogens, the diseases they cause, and consolidating this through modern laboratory classes and real research has given me the sense that I am contributing to such an important field with real-world applications to human disease. I've gained so many employable and transferable skills through practical classes, research and scientific writing.

ANTHONY MULETA

PhD

Area of study: Microbiology



MICROBIOLOGY

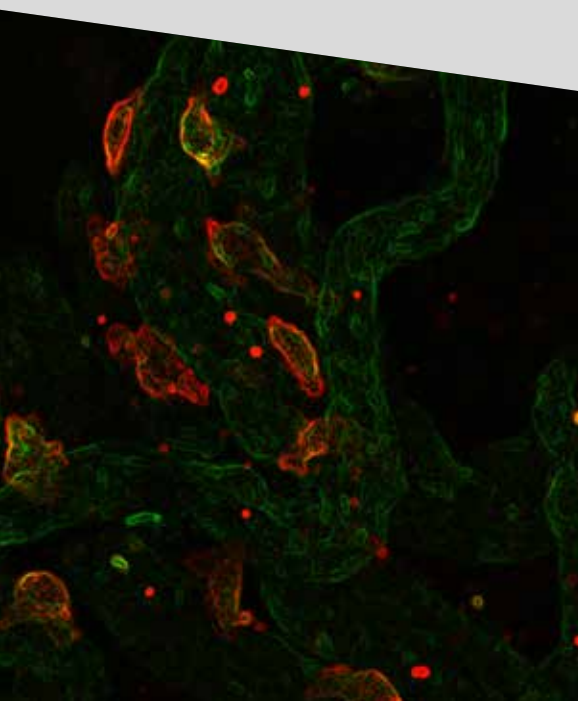
Microbiology is concerned with the study of microorganisms, their diversity, structure, molecular biology and how they interact with humans and other living organisms in both harmful and beneficial ways. Some of the most important scientific discoveries have been made by microbiologists, including the germ theory of disease, development of vaccines, discovery of antibiotics, and the demonstration that our genetic material is encoded by DNA molecules.

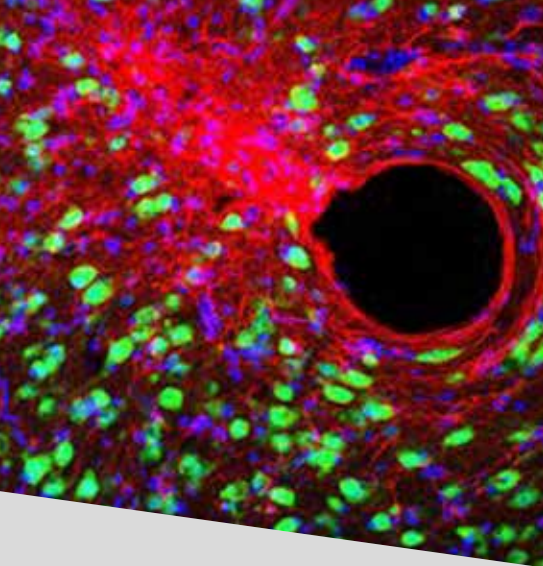
Why should I study microbiology?

Microbiology impacts upon a wide range of areas including human and animal health, the environment and climate science, food technology and safety, and the biotechnology industry. Today, like no other time in history, the importance of microorganisms can be seen from the impacts of infectious diseases throughout the world, the emergence and spread of antibiotic resistance, the Human Microbiome Project and the use of microorganisms.

What will I learn about?

- Microbes in health and disease
- Molecular microbiology
- Microbial biotechnology
- Pathogenesis of infectious disease
- Medical microbiology





PHARMACOLOGY

Pharmacology is the study of the effects of drugs on living organisms. You'll learn how drugs - whether natural or synthetic - affect biological systems. You'll also gain an understanding of how drugs can be used to treat specific diseases, and how new therapeutics are developed.

Why should I study pharmacology?

Knowledge about the ways in which drugs produce their effects is becoming increasingly important as the use and abuse of drugs becomes more widespread in our society. Understanding pharmacological concepts is fundamental to the safe and effective use of medicines by health professionals. Pharmacology is also central to the identification of new therapeutic targets, and enhances our understanding of human physiology.

What will I learn about?

- Principles of drug action
- Drugs and society
- Drugs in health and disease
- Neurological and endocrine pharmacology
- Modern drug development



What I like most about Pharmacology is that it combines the study of human diseases, physiology of the body and development of therapeutic interventions. The labs and workshops provide us with the fundamental knowledge of how drugs affect the body and teach us invaluable skills such as problem solving, teamwork, communication, critical thinking and data analysis. The academics are passionate about pharmacology and are very friendly, approachable and supportive. With medical advances expanding so rapidly, along with the knowledge of different human diseases, studying pharmacology can put you in the forefront of therapeutic research.

RAHINI RAGAVAN KAKUMANU

PhD

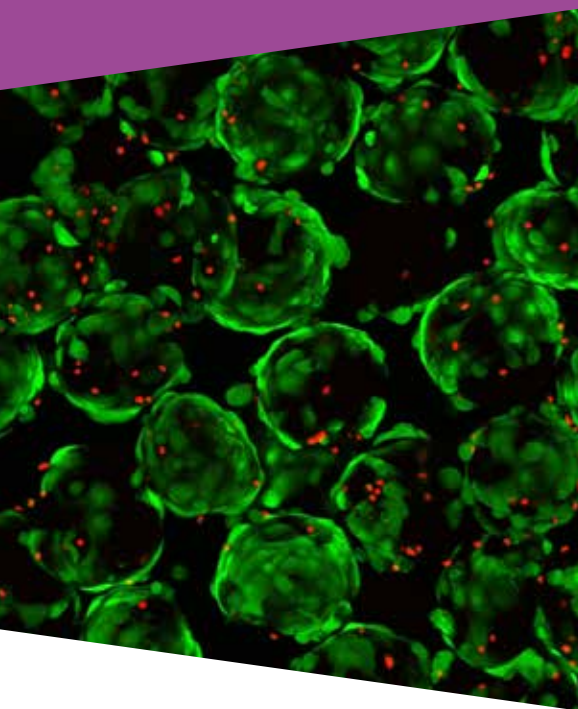
Area of study: Pharmacology

Studying Physiology was an eye opener as my understanding and appreciation of the human body grew exponentially. There is a lot of interesting cellular level physiological signalling that occurs every second which makes the human body function. For example, a simple task like moving your finger involves a network of cellular signals and tissue interactions. Cardiovascular physiology was one of the most fascinating topics because of the complexity to maintain heart rate, cardiac output, blood pressure and blood volume.

AADITYA SINGH

Bachelor of Science

Area of study: Physiology



PHYSIOLOGY

Physiology explores how the body works, and how it's affected by dysfunction and disease. You'll learn how molecules, cells and organs interact to form a living creature. From nerves to muscles, from the brain to hormones, physiologists are concerned with functions at all levels, spanning the molecular and cellular levels to organs and body systems.

Why should I study physiology?

By studying physiology, you'll develop an understanding of the integrated function of the whole body. You'll study normal function of the human body as well as common examples of adaptation to unusual environments, such as high altitude. This area of study will also provide you with greater insight into the basis of many common bodily dysfunctions, including heart disease, infertility and ageing.

What will I learn about?

- Neuroscience of communication, sensory and control systems
- Endocrine control systems
- Body systems physiology
- Exercise physiology and metabolism
- Clinical and experimental cardiovascular physiology
- Hormones and reproduction

FURTHER INFORMATION

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