

Anatomy and cell biology

The Department of Anatomy and Cell Biology is very active in both teaching and research. Our undergraduate teaching and learning specialises in three main areas: cell and developmental biology; neuroscience; and human anatomy. These disciplines represent some of the most active fields of research in the biological sciences today. Training in these areas will open up many exciting and rapidly expanding career opportunities in the biomedical sciences. Strong research groups within the department are supported by excellent external funding and departmental infrastructure. Our outstanding research performance underpins and invigorates our undergraduate teaching.

The Department of Anatomy and Cell Biology offers undergraduate majors in human anatomy, neuroscience, cell and molecular biology (with the School of Botany) and reproduction and development (with the Department of Zoology). All of these majors require students to undertake the life sciences package in first year. Subjects taught by the department complement majors in other areas.

Majors

The Department of Anatomy and Cell Biology coordinates the anatomy and neuroscience majors and teaches several subjects in the cell and molecular biology (coordinated by the School of Botany) and reproduction and development (coordinated by the Department of Zoology) majors. Detailed course plans for these majors are listed under *Majors* (p.9).

Anatomy

The anatomy major enables students to undertake studies in anatomy and embryology at 200- and 300-levels. The two 200-level subjects provide an introduction to basic principles of topographic anatomy and the embryological origins of adult body structures. The 300-level subjects focus on the anatomy of the head and neck and the organisation of connective tissues and joints. These subjects can be combined with studies in neuroscience or cell and developmental biology, allowing students to undertake studies in the areas that best suit their anatomical leanings. This major is designed for students interested in a solid grounding in anatomy with an intention of a future career in research or academia, or for those students interested in a career as a health professional.

Neuroscience

At 200-level, students wishing to do the neuroscience major take a new subject, 516-209 Introductory Neuroscience (p.2), taught in conjunction with the Department of Physiology. This subject provides a broad introduction to neuroscience, covering topics ranging from molecular and cellular neuroscience to higher level brain functions. It can be combined with complementary 200-level subjects in physiology, zoology, cell biology, biochemistry and molecular biology, psychology or behavioural sciences. At 300-level, students take two core subjects in neuroscience, taught by the Departments of Anatomy and Cell Biology and Physiology, together with a range of elective subjects which enable them to focus their interests in a particular area of neuroscience. This major provides ideal training for a career in basic or clinical neuroscience within university departments, research institutes and hospitals.

Cell biology

Students who choose this major undertake a core of 200-level subjects in cell biology, tissue and organ biology and molecular biology taught by the Departments of Anatomy and Cell Biology, the School of Botany and the Department of Biochemistry and Molecular Biology. This provides a suitable background for third-year studies in the areas of cell and developmental biology. A range of 300-level subjects in these areas is offered by the Departments of Anatomy and Cell Biology, the School of Botany and the Department of Zoology. This major will equip you for a career in many exciting new areas of biomedical science, including stem cell research and functional genomics.

Reproduction and development

This major requires the student to take a core of 200-level units in cell and tissue biology (taught by the Department of Anatomy and Cell Biology and School of Botany) and animal structure and function (taught by the Department of Zoology). At the 300-level, the major comprises a core of two subjects in reproductive and developmental biology, offered by the Departments of Zoology and Anatomy and Cell Biology plus a choice of elective subjects in cell biology or marsupial biology.

Bachelor of Science (Honours)

For information about the faculty and departmental entry requirements for honours, please refer to *Bachelor of Science (Honours) and Bachelor of*

Information Systems (Honours) (p.1). These requirements should be considered when planning your course.

Further information

Department of Anatomy and Cell Biology
The University of Melbourne
Victoria 3010
Tel: +61 3 8344 5814
Fax: +613 9349 5219
Web: <http://www.anatomy.unimelb.edu.au>

200-level subjects

516-201 Cell Biology: Tissues and Organs

Note:

- Not available to students enrolled in BBiomedSc.
- Previously known as 516-201 Histology (prior to 2001), 516-201 Micro-anatomy: Cells and Tissues (2001).
- Students must register for practical classes by writing their name and preference (two alternative times will be available) on the sheets displayed outside Room E241 during Orientation Week (26 February to 2 March). A subject handbook, containing timetables, lecture outlines and practical notes, is available from the department during Orientation Week.

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof P Whittington

Prerequisites: Biology 600-141 and 600-142

Contact: Twenty-four lectures (two a week) and 36 hours practical work (three hours a week) (*Semester 1*).

Description: Subject-specific skills that will be developed in this subject include the ability to:

- identify the range of cellular activities that are especially relevant to multicellular organisation;
- understand how external signals can lead to changes in gene expression and protein synthesis in cells;
- understand the basic ways that cells associate to form tissues;
- appreciate how the structural and functional properties of individual cells as well as cell-cell and cell-substrate interactions give each tissue its distinctive characteristics;
- understand how different tissue types are combined together to form organs and how organ function follows from the structure and function of their constituent tissues; and
- understand how cellular activities involved in the development, maintenance and function of tissues and organs are regulated by external signals.

These subject-specific skills will lay the groundwork for a wide variety of careers in basic and applied biomedical science, including stem cell research and therapeutic approaches to cancer and other human diseases.

Generic skills that will be fostered in this subject include:

- the development of generic analytical and problem-solving skills;
- collaborative learning in practical class groups; and
- the ability to integrate knowledge from disparate sources and at different levels of organisation.

Assessment: Continuous assessment on both theory and practical work (30%) and a 2-hour examination at the end of semester (70%).

Prescribed texts: B Alberts et al, *Essential Cell Biology*, 1998. **or** B Alberts et al, *Molecular Biology of the Cell*, 4th edn, 2002.

Recommended texts: L P Gartner and J L Hiatt, *Colour Textbook of Histology*, 2nd edn.

516-204 Anatomy 1

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof C A Briggs

Prerequisites: Biology 600-141 and 600-142

Contact: Thirty-two lectures (two to three 1-hour lectures per week) and 28 hours practical work (one 2- to 3-hour practical class per week) (*Semester 1*).

Description: By the end of this subject students should:

- comprehend the terminology of topographic anatomy; the principles relating to each of the following types of anatomical structure: skin, fascia and skeletal muscles, bones and joints, vessels, nerves and viscera; the organisation of the back and upper limb into regions and the trunk into cavities; the essential factual information regarding the specific anatomical structures which form the boundaries and contents of the back, thorax and upper limb; the applied anatomy of each region;
- develop observational and organisational skills to identify and interpret exposed anatomical structures and regions; communication skills (written

and oral) to describe the normal structure of the back, thorax and upper limb; skills in the manipulation of anatomical structures (with dissecting instruments); and

- appreciate the common occurrence of anatomical variation; the scientific basis of knowledge of structure.

The subject provides detailed information on:

- mammalian reproduction; gametogenesis; embryogenesis; embryo formative processes; foetal maternal relationships; development of basic tissues; organogenesis; development of nervous system, skeletal system, cardiovascular system, respiratory system; and
- the terminology of topographic anatomy, principles related to each type of anatomical structure; skin, fascia and skeletal muscles, bones and joints, vessels, nerves and viscera; the organisation of the back, thorax and upper limb into regions, and the specific structures forming the boundaries and contents of these regions. The applied anatomy of each region is studied.

Assessment: Continuous assessment in practical classes throughout the semester, a 2-hour written examination, a 30-minute practical examination at the end of the semester.

Prescribed texts: W H Hollinshead and C Rosse, *Textbook of Anatomy*, 5th edn, Lippincott Raven, 1997.

516-207 Anatomy 2

Credit points: 12.5

HECS-band: 2

Coordinator: Dr I Grkovic

Prerequisites: Biology 600-141 and 600-142

Contact: Thirty-two lectures (two to three 1-hour lectures per week) and 28 hours practical work (one 2- to 3-hour practical class per week) (*Semester 2*).

Description: By the end of this subject the student should be able to:

- comprehend the development of the gastrointestinal system and urogenital system; the terminology of topographic anatomy; the organisation of the trunk into cavities and the lower limb into regions; the essential factual information regarding the specific anatomical structures which form the walls and contents of the abdomen and pelvis and the boundaries and contents of the lower limb; the applied anatomy of the abdomen, pelvis and lower limb;
- develop observational and organisational skills to identify and interpret exposed anatomical structures and regions; communication skills (written and oral) to describe the normal structure of the abdomen, pelvis and lower limb; skills in the manipulation of anatomical structures (with dissecting instruments); and
- appreciate the embryonic basis of certain birth defects relating to the gastrointestinal and urogenital systems; the common occurrence of anatomical variation; the scientific basis of knowledge about development and structure; the importance of one's own observations; the need for continuing independent learning to keep pace with future advances.

The subject provides detailed information on the development of the gastrointestinal and urogenital system; the organisation of the abdomen, pelvis and lower limb and the structures which form their walls, boundaries and contents as well as the applied anatomy of the abdomen, pelvis and lower limb.

Assessment: Continuous assessment in practical classes throughout the semester, a 2-hour written examination, a 30-minute practical examination at the end of the semester.

Prescribed texts: W H Hollinshead and C Rosse, *Textbook of Anatomy*, 5th edn, Lippincott Raven, 1997.

516-209 Introductory Neuroscience

Note: This is a joint anatomy and cell biology and physiology subject.

Credit points: 12.5

HECS-band: 2

Coordinator: Prof A Goodwin, Assoc Prof J Bornstein

Prerequisites: Life science package OR any first-year biology, chemistry, physics or mathematics subject. Prerequisites may be waived by the Head of Department.

Contact: Thirty-six lectures (three 1-hour lectures per week) plus six two-hour tutorials (*Semester 2*).

Description: This subject provides a broad introduction to neuroscience. The topics covered range from the molecular and cellular mechanisms underlying neural function to an introduction to complex behaviours such as thought and language. It forms an ideal grounding for the more specialist third-year neuroscience subjects and should be taken by all students looking to major in neuroscience. Because of its broad nature, it is also suitable for students who wish to learn something about neuroscience without majoring in the topic.

The subject aims to provide the student with:

- an appreciation of how human behaviour, including complex functions like thought and emotion is mediated by the brain;
- an understanding of how neurons form the building blocks of the nervous system, how they transmit information by electrical impulses, how they

communicate with each other, how they are connected to form elementary circuits, how they store information;

- insight into the molecular and cellular mechanisms fundamental to neural function;
- a picture of the inter-relationships of the various parts of the nervous system; the brain, spinal cord, peripheral nervous system, automatic nervous system;
- an appreciation of the fundamentals of systems underlying sensory perception, including the transduction of sensory stimuli (for example light and sound) and the processing of sensory information by neuronal populations leading to perception;
- an understanding, at an elementary level, of how the nervous system initiates and controls movements of the body; and
- an appreciation of the plasticity of the nervous system, how it adapts to changing environments, how it ages, how nerve injuries may be repaired or may lead to irreversible damage.

Assessment: A 3-hour end-of-semester written examination, plus continuous assessment during the semester comprising a maximum of four ten-minute tests.

300-level subjects

516-302 Developmental Biology

Note: This subject is a joint anatomy and cell biology and zoology subject.

Credit points: 12.5

HECS-band: 2

Coordinator: Dr G Hime, Prof M Renfree

Prerequisites: 516-201. Zoology 654-203 and Biochemistry 521-211 and 521-212 is recommended.

BBiomedSc students: 521-213 and 536-250. Zoology 654-304 and 654-313 and Anatomy 516-306 are recommended.

Contact: Twenty-four lectures (two a week) and 24 hours practical/tutorial (times to be arranged) (*Semester 2*).

Description: Upon completion of this subject students should:

- comprehend the molecular, biochemical and cellular events that regulate the development of specialised cells, tissues and organs during embryonic development, particularly cell signalling pathways that regulate embryonic induction, tissue interactions and pattern formation, and expression of regulatory genes; and
- understand the experimental strategies and techniques that are used to identify the molecular and cellular mechanisms of development.

The following topics are considered: mechanisms of cell determination and commitment; embryonic organiser; mesoderm induction; establishment of the vertebrate body plan; positional specification; tissue patterning; cell migration; epithelial-mesenchymal interactions; sex determination; developmental potency; growth control; cell and tissue transplantation; nuclear transplantation; cell ablation; cell lineage tracing; organogenesis in vitro; transgenesis; gene knockout; and developmental mutations.

Students will also gain the generic skills listed below:

- critical analysis of data;
- ability to solve complex problems;
- oral and written communication skills, including public speaking and summary reports of complex data;
- teamwork skills in the analysis and interpretation of data;
- working as a team to perform new experimental tasks; and
- time management skills.

Assessment: A 2-hour end-of-semester written examination (60%), a critical review of two published journal articles (15%) and three practical reports (25%).

Prescribed texts: Wolpert, Beddington, Jessell, Lawrence and Meyerowitz, *Principles of Development*, 2nd edn, Oxford University Press, 2002.

516-304 Functional and Applied Anatomy

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof C A Briggs

Prerequisites: One of anatomy 516-204, 516-207, 516-303.

Contact: Forty-eight hours contact time involving approximately equal weighting of lectures and practical classes. Precise subject details will be made known at the commencement of the subject (*Semester 2*).

Description: Upon completion of this subject students should have an appreciation of:

- the structure and function of connective tissues and their response to normal and abnormal loading, the forces acting across joint complexes and how they may be measured;

- the functional and applied anatomy of the body's major joint complexes; including the joints of the vertebral column, shoulder, elbow complex, wrist and hand, pelvis, hip, knee, ankle and foot;
- the factors responsible for normal and abnormal gait and locomotion;
- the use of anthropometric techniques in the determination of normal and abnormal postures; and
- the use and application of anthropological techniques to determine, age, sex, stature and racial affinity.

The subject provides detailed information on connective tissues, muscle and tendon, ligament and nerve, and their response to normal and abnormal stress and strain; the forces acting across synovial joints and methods of measuring these forces; normal and abnormal movement patterns, and the principles underlying gait and locomotion; anthropometric techniques; skeletal traits important in human identification; and dissection of selected joint structures.

Generic skills include capacity for independent study, rational inquiry and self-directed learning, ability to analyse problems; oral and written communication skills; time management skills; teamwork in interpretation and analysis of new information.

Assessment: A 30-minute multiple choice quiz (20%); a dissection project (30%) and a 2-hour written examination (50%).

Prescribed texts: M Nordin and V H Frankel, *Basic Biomechanics of the Musculoskeletal System*, 2nd edn, Lea and Febiger, 1989.

516-305 Structure & Function of the Brain

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof S Rees

Prerequisites: Anatomy 516-209.

BBiomedSc students: 521-213 and 536-250.

Contact: Twenty-four lectures (two a week) and 10 hours tutorial or practical work (*Semester 2*).

Description: By the end of the subject the student should:

- comprehend the terminology of neuroscience, the principles and essential information regarding the structure and functional components of the nervous system including their organisation and major connections, the correlation of structure with function including behaviour, and the major effects of lesions to clinically important areas and pathways; and
- appreciate the extent and limitations of current knowledge of the organisation of the nervous system, particularly in the context of recent profound advances in neuroscience.

The following topics will be considered: the structure and function of the main sensory systems (including vision, hearing and touch) and the motor systems; complex functions such as thought, emotion, motivation, memory and the disorders of thought and mood.

Students will acquire an understanding of the major questions in neuroscience and the experimental tools that are being used to address them; develop written communication skills; an ability to critically analyse scientific papers; and a capacity for independent critical thought, rational enquiry and self-directed learning.

Assessment: A critical review of a scientific paper (15%), a test during the semester (10%), and a 2-hour end-of-semester written examination (75%)

Prescribed texts: Kandel, Schwartz and Jessell, *Principles of Neural Science*, 4th edn.

Recommended texts: J Nolte, J B Angerine, *The Human Brain in Photographs and Diagrams*.

516-306 Developmental Neurobiology

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof P Whittington

Prerequisites: Anatomy 516-201 plus 516-209.

BBiomedSc students: 521-213 and 536-250.

Contact: Thirty-six lectures (three 1-hour lectures per week) (*Semester 1*).

Description: On completion of this subject, students should:

- appreciate the major processes involved in the development of the nervous system, including neural induction, neural patterning, neural and glial cell proliferation, determination of neural fate, neuronal migration, axon guidance, regulation of neuron survival and synaptogenesis;
- have gained some insights into the cellular and molecular basis of those processes and understand how disorders in developmental processes can lead to neural defects;
- be aware of the regenerative ability of the nervous system and the prospects for therapeutic treatment of neural injury and disease;
- be familiar with outstanding questions currently being addressed in research in neural development; and

- be familiar with modern experimental approaches used to investigate the development of the nervous system and appreciate their strengths and limitations.

This subject will help students develop the following generic skills:

- critical analysis of scientific research papers;
- capacity for independent critical thought, rational enquiry and self-directed learning;
- ability to participate effectively in collaborative learning as a team member;
- oral and written communication skills, including public speaking; and
- ability to plan work and use time effectively.

Assessment: A 2-hour end-of-semester written examination (65%), a 30-min test during the semester (10%), an essay (15%) and an oral review of a scientific paper (10%).

Recommended texts: Kandel, Schwartz and Jessell, *Principles of Neural Science*, 4th edn. **or** Zigmond, Bloom, Landis, Roberts and Squire, *Fundamental Neuroscience*.

516-307 Project Study in Anatomy & Cell Biology

Note:

- Admission to the subject will depend upon the student's background and the availability of a suitable project. This subject may involve the use of animals in experiments.
- Students must contact the coordinator prior to enrolling to arrange a supervisor.

Credit points: 12.5

HECS-band: 2

Coordinator: Dr C Anderson, Dr G Hime

Prerequisites: A total of 25 points at 200-level in any combination of anatomy, cell biology, physiology or biochemistry and molecular biology, or with permission of Head of Department. Approval to take this subject must be obtained from the coordinator.

Contact: At least 60 hours of laboratory work (*Semester 1, repeat 2, Summer*).

Description: By the end of the subject students should:

- comprehend the principles of research;
- develop skills to critically analyse research papers in anatomy, cell biology, developmental biology or neuroscience; and research laboratory skills;
- develop laboratory skills in a particular aspect of anatomy, cell biology, developmental biology or neuroscience;
- appreciate the extent and limitations of research in anatomy, cell biology, developmental biology or neuroscience; and
- have participated in a supervised research project focused on anatomy, cell biology, developmental biology or neuroscience.

Assessment: Review or journal article (no more than 1500 words) (20%); written report of research project (no more than 4000 words) (60%); and oral presentation of research report (10 minutes) (20%).

516-308 Advanced Studies in Human Anatomy

Credit points: 12.5

HECS-band: 2

Coordinator: Assoc Prof C Briggs

Prerequisites: One of 516-204 or 516-207.

Contact: Twelve lecture/tutorials (one per week) and 48 hours of practical work (one four-hour practical class per week) (*Semester 1*).

Description: Upon completion of this subject students should have an appreciation of:

- the organisation of the human body into regions and the detailed anatomy of the structures forming the boundaries and contents of these regions;
- the applied and clinical anatomy of each region studied;
- the applied and clinical anatomy of the head and neck, advanced anatomy of the joints and regions of the limbs; and
- the detailed regional anatomy of the back, thorax, abdomen and pelvis.

The subject provides detailed information at an advanced level on the developmental and comparative anatomy of the head and neck; anatomy of the joints and regions of the limbs; the detailed regional anatomy of the back, thorax, abdomen and pelvis.

Major generic skills include capacity for independent study, rational inquiry and self-directed learning, ability to analyse problems, oral and written communication skills, time management skills, teamwork in interpretation and analysis of new information.

Assessment: A critical review of a scientific research paper (15%), an end-of-semester practical examination (50%), and an oral presentation of results of a research project (35%).

Prescribed texts: K L Moore and A F Dalley, *Clinically Oriented Anatomy*, 4th edn, Lippincott Williams & Wilkins 1999. **or** C Rosse and P Gaddum-Rosse, *Hollinshead's Textbook of Anatomy*, 5th edn, Lippincott-Raven 1997.