

School of Biological Sciences  
*Te Kura Mātauranga Koiora*

**BIOL228**  
**Animal Diversity**  
**Course Notes, Trimester 1 -2012**



Name.....

VICTORIA  
UNIVERSITY OF  
WELLINGTON  
*Te Whare Wananga  
o te Upoko o te Ika a Maui*



### Copyright Warning Notice

This set of Student Notes may be used only for the University's educational purposes. It includes extracts of copyright works copied under copyright licences. You may not copy or distribute any part of the Student Notes to any other person. You may not make a further copy for any other purpose. Failure to comply with the terms of this warning may expose you to legal action for copyright infringement and/or disciplinary action by the University

# Table of Contents

## Course Outline

General information.....	
Course Objectives and Assessment.....	
Assessment schedule.....	
Lecture schedule.....	
Laboratory schedule.....	
Biological drawings for insect laboratories.....	
General University policies and statutes.....	
Animal ethics guidelines.....	

<b>Invertebrate Module .....</b>	
----------------------------------	--

<b>Insect &amp; Arachnid Module diagrams.....</b>	
---	--

<b>Fish Module .....</b>	
--------------------------	--

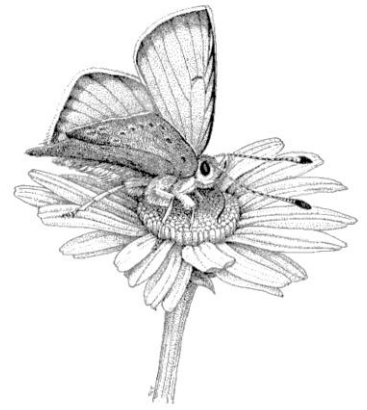
<b>Tetrapods laboratory programme.....</b>	
--	--

Who's who in the tetrapods.....	
Laboratory 1 – Amphibians I.....	
Laboratory 2 – Amphibians II.....	
Laboratory 3 – Reptiles.....	
Laboratory 4 – Biodiversity in form and function.....	
Laboratory 5 – Bird and mammal evolution.....	
Laboratory 6 – Measuring diversity.....	
Laboratory 7 – Animals in action and <i>ex situ</i> biodiversity.....	

# Biology 228

## Animal Diversity

### Course Outline 2012



---

School of Biological Sciences

BIOL 228

Trimester 1/3

20 points

---

## GENERAL INFORMATION

**STAFF:**        **Course Coordinator:**

Dr. Wayne L. Linklater, KK 617, 463-5233 ext. 8575, [Wayne.Linklater@vuw.ac.nz](mailto:Wayne.Linklater@vuw.ac.nz)

**Other Lecturers:**

Dr Shane Geange, CEL 001, 470-9258, [Shane.Geange@vuw.ac.nz](mailto:Shane.Geange@vuw.ac.nz)

Dr. Stephen Hartley, KK620, 463-5447, [Stephen.Hartley@vuw.ac.nz](mailto:Stephen.Hartley@vuw.ac.nz)

Dr. Nicola Nelson, KK621, 463-5435, [Nicola.Nelson@vuw.ac.nz](mailto:Nicola.Nelson@vuw.ac.nz)

Dr Nicole Phillips, KK723, 463-8049, [Nicole.Phillips@vuw.ac.nz](mailto:Nicole.Phillips@vuw.ac.nz)

Dr. Jeff Shima, KK610, 463-6494, [Jeff.Shima@vuw.ac.nz](mailto:Jeff.Shima@vuw.ac.nz)

**TIMETABLE:**        Lectures: 10:00-10:50 Tuesday, Wednesday, and Thursday 10:00-10:50 HMLT206.  
Laboratories, KK109: Tuesday & Friday 1-3 pm OR 3-5 pm.

**WITHDRAWAL DATES:** see <http://www.victoria.ac.nz/home/admisenrol/payments/withdrawalsrefunds.aspx>

**PRESCRIPTION:**    Diversity, form and function of animals, an overview of the taxonomic diversity of all animals; focused study of selected aquatic, marine and terrestrial species including annelids, molluscs, arthropods, and vertebrates.

**PREREQUISITE:**    BIOL 114 or ZOOL 111

**RESTRICTION:**    BIOL 217, BIOL 218, ZOOL 211

**TEXTBOOKS:**     The recommended text book of the course:

Hartley, Linklater, Nelson, Phillips & Shima (2009) BIOL228 – Animal Diversity.  
McGraw-Hill

available from the university's book shop. It is a composite text specially prepared for this course from several other texts including chapters from:

Hickman, C.P., Roberts, L.S. and Larson, A. 2003. *Animal Diversity*. 4th ed. McGraw-Hill, Boston. QL 47.2 H628A;

Lindzey, D. 2001. *Vertebrate Biology*. 1<sup>st</sup> ed. McGraw-Hill, Boston; and

Hickman, C.P., Roberts, L.S., Keen, S.L., Larson, A., I'Anson, H., Eisenhour, D.J. 2008. *Integrated Principles of Zoology*. McGraw-Hill, Boston. QL47.2 H628 I 14<sup>th</sup> ed.

These texts or earlier editions are available in the central library as indicated by the call

numbers. As well as these the following texts may also be useful to read around the topics:

### **General**

Miller, S.A. and Harley, J.B. 2001. *Zoology*. 4<sup>th</sup> ed. McGraw-Hill, Boston. QL47.2 M651 Z

### **Invertebrates**

Brusca, R. C. and G. J. Brusca 2003. *Invertebrates*. 2<sup>nd</sup> ed. Sinauer, Sunderland, MA, USA. QL362 B9121

Pechenik, J. A. 2000. *Biology of the Invertebrates*. 4<sup>th</sup> ed. McGraw Hill, Boston.

### **Vertebrates**

Kardong, K. V. 1998. *Vertebrates: Comparative Anatomy, Function, Evolution*. McGraw-Hill, Boston. QL805 K18 V 3ed

### **Insects and arachnids**

Forster, R. and Forster, L. (1999) *Spiders of New Zealand and their Worldwide Kin*. University of Otago Press. 270 pp. QL457.7 F734 S

Grimaldi, D. and Engel, M.S. (2005) *Evolution of the Insects*. Cambridge University Press. 755 pp. QL468.7 G861 E

Gullan, P.J. and Cranston, P.S. (2000) *The Insects: An Outline of Entomology*. 2nd edition. Blackwell Science. Oxford. 470 pp. QL463 G973

### **Fishes**

Helfman, G.S., Collette, B.B. and Facey, D.E. 1997 (or later versions). *The diversity of fishes* Blackwell Science. QL615 H474 D

### **Birds**

Paul, G. S. 2002. Dinosaurs of the air: the evolution and loss of *flight* in dinosaurs and birds. QE871 P324 D

### **Mammals**

Wallace, D. R. 2005. Beasts of Eden: walking whales, dawn horses, and other enigmas of *mammal evolution*. QL708.5 W188 B

Jackson, S. 2003. Australian mammals: biology and **captive** management. SF405 J14 A

Students are expected to read from a variety of references. This is not a “reading list” in the sense of you having to read the entire content of books listed. It is intended as a guide to some of the more important information relevant to lectures and laboratories. The list above is not exhaustive - you will find many other useful books on general Zoology in the library and listed in the main catalogue. You should make a practice of

referring to reference texts in order to supplement your lecture notes. Additional references may be suggested as the semester progresses. Supplementary readings and notes may be made available throughout the semester at lecture and laboratory times or on blackboard.

- MATERIALS:*** Each student should purchase and use a sturdy laboratory notebook (with pencil) in which they can include drawings and notes from laboratory practical sessions.
- BLACKBOARD:*** Information and lecture notes relevant to the course will be made available to you via “Blackboard”, a course management software package. <http://blackboard.vuw.ac.nz>
- CLASS REPRESENTATIVE:*** A class representative will be elected during the first week of lectures. This person will fulfil the usual duties of this position.
- SAFETY:*** Safety is always the priority. Be aware of all exits to the classroom and building. Also be aware of the location of the first aid kit and eye wash station. In case of fire, evacuate the building in an orderly, rapid manner. In the event of earthquake, find shelter under desks. There is no eating or drinking in the laboratory. Store backpacks on the shelves provided. A laboratory coat must be worn whenever you are in a laboratory.

# COURSE OBJECTIVES AND ASSESSMENT

**OBJECTIVES:** The objectives of this course are to understand the forms and functions of representative organisms from a range of animal phyla. Students will become familiar with the taxonomic and evolutionary relationships among different animal body plans. They also will learn how physiological system functions relate to the ecology and behaviour of the organisms.

**COURSE DELIVERY:** The course is delivered in lecture and laboratory formats.

**ASSESSMENT:** Assessment will include two laboratory practical tests covering invertebrate and vertebrate content of the course, respectively, and a final exam as described by the next headings.

**EXPECTED WORKLOAD:** The course is 20 points and so the workload per student is designed to approximate 200 hours for the trimester, including lecture and laboratory time. This amounts to approximately 17 hours per week. Lectures and laboratories constitute 7 hours per week, leaving around 10 hours for study and revision towards in-term and final assessment.

**INVERTEBRATE TEST:** One test, covering laboratory and lecture material, will contribute 25% of total marks. This will test your mastery of key ideas and facts from the invertebrate sections of the course including insects, and will consist of one-word and short answer questions.

**VERTEBRATE TEST:** One test, covering six weeks of vertebrate lecture and laboratory material, will contribute 25% of total marks. This will test your mastery of key ideas and facts from the fish, amphibian, reptile, bird and mammal sections of the course, and will consist of short answer questions.

**FINAL EXAM:** The final exam will contribute 50% of the course marks and will cover the entire semester's work (i.e., this exam will be CUMULATIVE). Two hours will be allowed for this exam. No books, notes, or electronic devices will be permitted during the exam.

**GRANTING OF TERMS:** Terms are granted only to students who take the practical tests and achieve at least 20 marks in the in-term assessment.

## ASSESSMENT SCHEDULE:

<u>Event</u>	<u>Date</u>	<u>Percentage</u>
Invertebrate Practical Test - including Insects & Arachnids	27 April	25
Vertebrate Practical Test - Fish, Amphibians, Reptiles, Mammals & Birds	8 June	25
Final Examination	<b>T.B.A</b>	50

Students who enrol in courses with examinations should be able to attend an examination at the University at any time during the formal examination period between 11 June – 4 July.

---

**Total Course Assessment: 100 marks**

## LECTURE SCHEDULE

Week	Date	Lecture No.	Topic	Lecturer
1	6 Mar	1	Overview of Animals	NP
	7 Mar	2	Porifera	NP
	8 Mar	3	Cnidaria	NP
2	13 Mar	4	Annelida, other worms	NP
	14 Mar	5	Mollusca	NP
	15 Mar	6	Arthropoda: Crustacea	NP
3	20 Mar	7	Echinodermata	NP
	21 Mar	8	“Minor” phyla	NP
	22 Mar	9	Invertebrate synthesis	NP
4	27 Mar	10	Insect diversity and evolution	SH
	28 Mar	11	Insect external anatomy	SH
	29 Mar	12	Insect internal anatomy	SH
5	3 Apr	13	Development and life histories, and aquatic insects	SH
	4 Apr	14	Sensory systems & plant-insect interactions	SH
	5 Apr	15	Social insects and soil insects	SH

### MID-TRIMESTER BREAK 9 - 20 April

6	24 Apr	16	Spiders and other arachnids	SH*
	<b>25 Apr</b>	<b>ANZAC Day</b>		
	26 Apr	17	Predation, parasitism and defence	SH
7	1 May	18	Fish evolution	JS
	2 May	19	Chondrichthyes and Teleosts	JS
	3 May	20	Fish sensory abilities	JS
8	8 May	21	Fish reproduction	JS
	9 May	22	Fish swimming and buoyancy	JS
	10 May	23	Fish respiration and homeostasis	JS
9	15 May	24	Amphibians	NN
	16 May	25	Amphibians	NN
	17 May	26	Amphibians	NN
10	22 May	27	Reptiles	NN
	23 May	28	Reptiles	NN
	24 May	29	Reptiles	NN
11	29 May	30	Birds	WL
	30 May	31	Birds	WL
	31 May	32	Birds	WL
12	5 Jun	33	Mammals	WL
	6 Jun	34	Mammals	WL
	7 Jun	35	Mammals	WL

---



## LABORATORY SCHEDULE

Week	Date	Lab No.	Topic	Lecturer
1	6 Mar	1	<b>NO LABORATORY</b>	NP
	9 Mar	2	Porifera & Cnidaria	NP
2	13 Mar	3	Annelids, other worms	NP
	16 Mar	4	Molluscs	NP
3	20 Mar	5	Arthropods: Crustacea	NP
	23 Mar	6	Echinodermata, minor phyla	NP
4	27 Mar	7	External morphology of locust	SH
	30 Mar	8	Internal morphology of a locust	SH
5	3 Apr	9	Aquatic insects: nymphs and larvae	SH
	6 Apr		<b>Good Friday (no laboratory)</b>	

### MID-TRIMESTER BREAK 9 – 20 April

6	24 Apr	10	Spiders and other arachnids	SH*
	27 Apr	11	<b>Invertebrate Practical Test</b>	NP & SH
7	1 May	12	Fish I – Taxonomy, Phylogeny and Evolution	SG
	4 May	13	Fish II – Functional Morphology and Life Histories	SG
8	8 May	14	Fish III – Chondrichthyes Anatomy and Morphology	SG
	11 May	15	Fish IV – Teleost Anatomy and Morphology	SG
9	15 May	16	Amphibians	NN
	18 May	17	Frogs	NN
10	22 May	18	Reptiles	NN
	25 May	19	Biodiversity in form and function: locomotion & feeding	WL
11	29 May	20	Bird & Mammal evolution	WL
	1 Jun	21	Measuring diversity: urban birds	WL
12	5 Jun	22	Animals in action and <i>ex situ</i> biodiversity	WL
	8 Jun	23	<b>Vertebrate Practical test</b>	JS, NN, WL

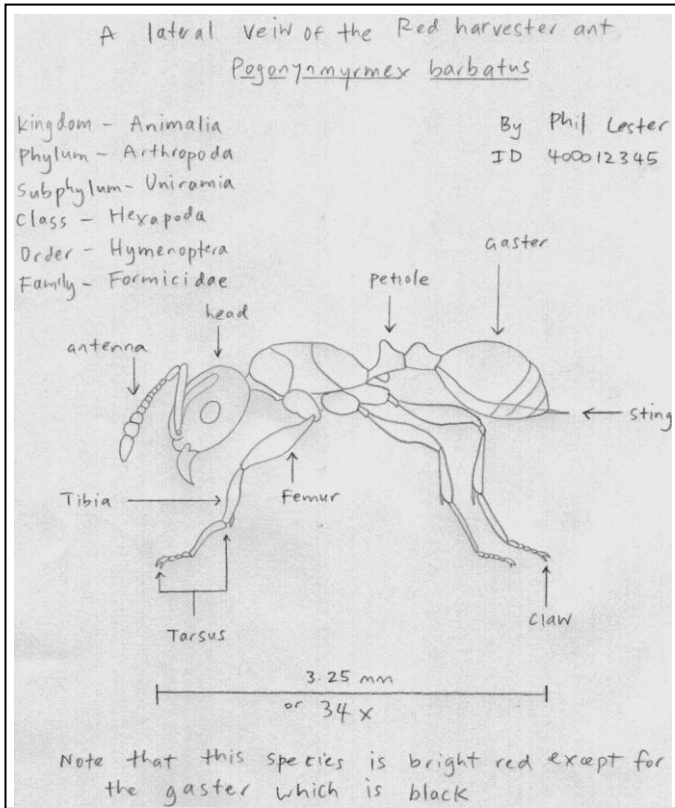
### Lecturers

JS = Jeff Shima; NN = Nicky Nelson; NP = Nicole Phillips; SG = Shane Geange; SH = Stephen Hartley; WL = Wayne Linklater

\* Guest lecture and laboratory by Phil Sirvid (Te Papa, Museum of New Zealand's, arachnologist in residence)

## BIOLOGICAL DRAWINGS FOR THE INSECT LABORATORIES

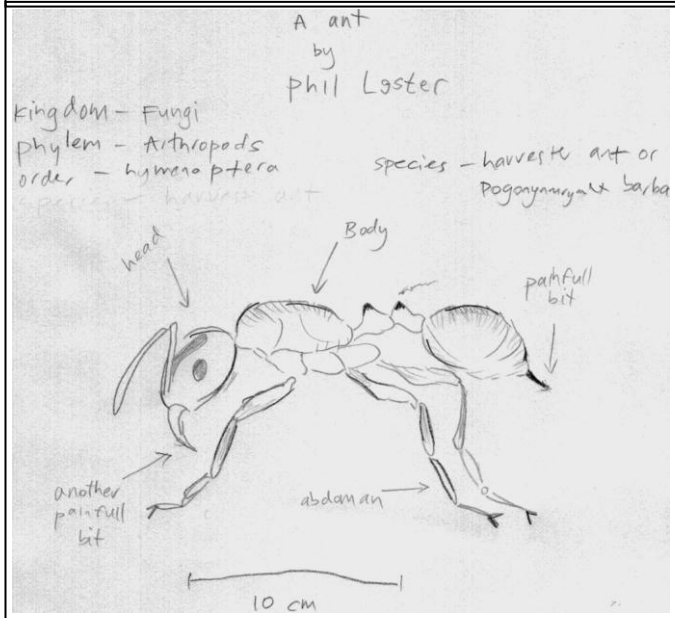
During each of the insect laboratories you will be asked to draw arthropods. Your first drawing will be handed in and marked (but not assessed). Remember, drawings should be made after observation of the main features of your specimen and should be an accurate representation of your specimen (i.e. they are not to be idealized). Start your drawing by deciding how large your specimen should be on the paper—don't make them too small! A good and bad example:



### A "GOOD" EXAMPLE

1. The drawing is a good size for the page
2. There is an informative title with Genus and species names underlined
3. A classification list for the specimen is given
4. Drawing lines join up
5. No shading of body parts occurs on the drawing
6. Correct labels are given and lines pointing to each of the features are ruled horizontally or vertically
7. An idea of scale is given, using a ruled line
8. The drawing has been undertaken with a sharp pencil
9. There are notes at the bottom of the page concerning the drawing
10. The student name and ID number is on the page

← [note the box represents a full A4 page]



### A "BAD" EXAMPLE

1. The title is not informative and Genus and species names are not underlined
2. The classification list for the specimen is incorrect
3. Lines do not join up
4. A poor idea of scale is given, using an un-ruled line
5. Shading of body parts occurs on the drawing
6. Labeling is insufficient and incorrect, lines pointing to each feature are not ruled
7. Although an idea of scale is given, it is not with a ruled line
8. No notes occur at the bottom of the page concerning the drawing
9. Only the student name is on the page



## General University Policies and Statutes

Students should familiarise themselves with the University's policies and statutes, particularly the Assessment Statute, the Personal Courses of Study Statute, the Statute on Student Conduct and any statutes relating to the particular qualifications being studied; see the Victoria University Calendar available in hard copy or on the VUW website at

<http://www.victoria.ac.nz/home/study/calendar.aspx>

### Student and Staff Conduct

The Statute on Student Conduct together with the Policy on Staff Conduct ensure that members of the University community are able to work, learn, study and participate in the academic and social aspects of the University's life in an atmosphere of safety and respect. The Statute on Student Conduct contains information on what conduct is prohibited and what steps are to be taken if there is a complaint. For information queries about complaint procedures under the Statute on Student Conduct, contact the Facilitator and Disputes Advisor or refer to the statute on the VUW policy website at:

[www.victoria.ac.nz/home/about/policy/students.aspx](http://www.victoria.ac.nz/home/about/policy/students.aspx)

The Policy on Staff Conduct can be found on the VUW website at:

[www.victoria.ac.nz/home/about/policy/staff.aspx](http://www.victoria.ac.nz/home/about/policy/staff.aspx)

### Academic Grievances

If you have any academic problems with your course you should talk to the tutor or lecturer concerned; class representatives may be able to help you in this. If you are not satisfied with the result of that meeting, see the Head of School or the relevant Associate Dean; the VUWSA Education Coordinator is available to assist in this process. If, after trying the above channels, you are still unsatisfied, formal grievance procedures can be invoked. These are set out in the Academic Grievance Policy which is published on the VUW website at:

[www.victoria.ac.nz/home/about/policy/students.aspx](http://www.victoria.ac.nz/home/about/policy/students.aspx)

### Academic Integrity and Plagiarism

Academic integrity means that university staff and students, in their teaching and learning are expected to treat others honestly, fairly and with respect at all times. It is not acceptable to mistreat academic, intellectual or creative work that has been done by other people by representing it as your own original work.

Academic integrity is important because it is the core value on which the University's learning, teaching and research activities are based. Victoria University's reputation for academic integrity adds value to your qualification.

The University defines plagiarism as presenting someone else's work as if it were your own, whether you mean to or not. 'Someone else's work' means anything that is not your own idea. Even if it is presented in your own style, you must acknowledge your sources fully and appropriately. This includes:

- Material from books, journals or any other printed source
- The work of other students or staff
- Information from the internet
- Software programs and other electronic material

- Designs and ideas
- The organisation or structuring of any such material

Find out more about plagiarism, how to avoid it and penalties, on the University's website: [www.victoria.ac.nz/home/studying/plagiarism.html](http://www.victoria.ac.nz/home/studying/plagiarism.html)

### **Students with Impairments** (see Appendix 3 of the Assessment Handbook)

The University has a policy of reasonable accommodation of the needs of students with disabilities. The policy aims to give students with disabilities the same opportunity as other students to demonstrate their abilities. If you have a disability, impairment or chronic medical condition (temporary, permanent or recurring) that may impact on your ability to participate, learn and/or achieve in lectures and tutorials or in meeting the course requirements, please contact the course coordinator as early in the course as possible. Alternatively, you may wish to approach a Student Adviser from Disability Support Services (DSS) to discuss your individual needs and the available options and support on a confidential basis. DSS are located on Level 1, Robert Stout Building:

telephone: 463-6070

email: [disability@vuw.ac.nz](mailto:disability@vuw.ac.nz)

The name of your School's Disability Liaison Person is in the relevant prospectus or can be obtained from the School Office or DSS.

### **Student Support**

Staff at Victoria want students to have positive learning experiences at the University. Each faculty has a designated staff member who can either help you directly if your academic progress is causing you concern, or quickly put you in contact with someone who can. Assistance for specific groups is also available from the Kaiwawao Maori, Manaaki Pihipihinga or Victoria International.

In addition, the Student Services Group (email: [student-services@vuw.ac.nz](mailto:student-services@vuw.ac.nz)) is available to provide a variety of support and services. Find out more at:

[www.victoria.ac.nz/st\\_services/](http://www.victoria.ac.nz/st_services/)

VUWSA employs an Education Coordinator who deals with academic problems and provides support, advice and advocacy services, as well as organising class representatives and faculty delegates. The Education Office (tel. 463-6983 or 463-6984, email at [education@vuwsa.org.nz](mailto:education@vuwsa.org.nz)) is located on the ground floor, Student Union Building.

# Ethical guidelines for students in laboratory classes involving the use of animals and animal tissues



Australian and New Zealand  
Council for the Care of Animals  
in Research and Teaching

## Introduction

The use of animals or animal tissues in laboratory classes is a privilege that brings with it responsibilities. These responsibilities go well beyond the need to avoid cruelty to animals and involve a genuine commitment to their welfare and a respect for the contribution they make to your learning. Outlined below are principles to consider in helping you to meet these responsibilities and to derive maximum benefit from the use of animals in laboratory classes.

## *Principles to consider*

- 1. Consider why animals or animal tissues are being used in the laboratory**

The justification for using animals should be to enhance educational outcomes, while recognising that at the same time there is the potential for harm to animals to achieve these outcomes. Consideration should always be given to whether the educational outcomes could be achieved without the use of animals or animal tissues. Every student and staff member should be mindful of the Three Rs (replacement, reduction, and refinement) when working with animals in a teaching environment.
- 2. Consider the requirements for animal welfare and animal handling**

At all times the welfare of the animal you use is your responsibility not just your teacher's responsibility. This can be considered as a "duty of care". If you are required to handle animals during a laboratory class, it is important to follow the instructions of staff in the correct handling and restraint techniques for the species with which you are working.
- 3. Consider the regulatory environment**

The use of animals in research, testing and teaching is regulated in New Zealand by legislation under the Animal Welfare Act 1999. This Act has an underlying principle of a "duty of care". It also requires approval from an institution's Animal Ethics Committee (AEC) for work in the teaching environment that uses animals or animal tissues. Gaining this approval involves justification for using animals (species and number), the means by which animals will be handled and, if required, humanely killed, and the educational outcomes of the laboratory work balanced against any potential harm to the animals used. The skills of the staff involved and the supervision of the students are also evaluated. In fact, the questions raised by AECs should be those asked by each student regarding the use of animals or animal tissues in their laboratories.
- 4. Consider your own views in using animals or animal tissues in the laboratory**

You should discuss the use of animals and animal tissues with other students and staff. Opinions should be formed and aired, with appropriate justification, in an open and accepting environment. You should feel free to make suggestions that might improve future laboratory classes, and to this end, student opinion regarding the use of animals in teaching should be encouraged.
- 5. Consider your responsibility to make sure that good use is made of the learning opportunity**

You should know what underlying principles are being taught in the class and understand the details that illustrate those principles. This involves reading background material from lecture notes and references before coming to class, reading the laboratory manual before the class, and being generally prepared to maximise the learning experience. Use every opportunity, within the approved scope of the class, to develop manual, observational, and recording skills.

---

ANZCCART has the following objectives:

- to promote excellence in the care of animals used in research and teaching and thereby minimise any discomfort that they may experience;
- to ensure that the outcomes of the scientific uses of animals are worthwhile; and
- to foster informed and responsible discussion and debate within the scientific and wider community regarding the scientific uses of animals.

Websites: [www.rsnz.org/advisory/anzccart/](http://www.rsnz.org/advisory/anzccart/) and [www.adelaide.edu.au/ANZCCART/](http://www.adelaide.edu.au/ANZCCART/)