



Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

2Department of Zoology

# Zoology Senior Sophister Handbook 2020–2021



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## **A Note on this Handbook**

This handbook applies to all students taking the Zoology Programme taught by the School of Natural Sciences. It provides a guide to what is expected of you on this programme, and the academic and personal support available to you. Please retain for future reference. Alternative formats of the Handbook can be made on request.

The information provided in this handbook is accurate at time of preparation. Any necessary revisions will be notified to students via email, blackboard and on the Zoology notice board, and will be updated on the Zoology website. Please note that, in the event of any conflict or inconsistency between the General Regulations published in the University Calendar and information contained in programme or local handbooks, the provisions of the General Regulations in the Calendar will prevail.

## **COVID-19 (Coronavirus) College Guidelines**

Information for students relating to the implementation of government guidelines with respect to the ongoing global COVID-19 (Coronavirus) pandemic can be found on the College website at the (<https://www.tcd.ie/about/coronavirus/>). We will be teaching in a dynamic environment where societal restrictions may change in either direction and at short notice. It is important to keep up to date with the College's information and to keep in contact with your classmates, lecturers, course convenor and teaching office.

## Welcome

The Discipline of Zoology at Trinity aims to make discoveries, educate and engage society in the science of whole organism biology, ecology and conservation, with a particular focus on animals. Through our research, education and engagement with society we seek to advance scientific understanding and contribute solutions to global challenges to the environment, health and human wellbeing.

The general philosophy behind the Senior Sophister year is to equip and encourage you to develop independence of thought and learning practices. You will develop the skills to enable you to succeed in your future employment or advance to further formal study and, crucially, equip you for the life-long learning which is essential for adapting to new information, work practices and cultures.

You will have the opportunity to specialise in the areas that most interest and inspire you, with electives available across a wide range of systems and levels of organisation from the sub-cellular to the landscape level. You will undertake an independent research project and attend seminars at the cutting edge of international research through our seminar series. We hope that the deep knowledge you will gain of your chosen elective modules and research topics will provide you with a solid scientific framework from which to think creatively and explore the natural world and its interactions with human society.

*Ian Donohue*  
Head of Discipline

## A Word from the Course Advisor

Welcome to your Senior Sophister year in Zoology. This is what the last three years have been all about – you are now on the threshold of graduation as a Zoologist. The coming year will be a lot of hard work but also, we hope, fun. The programme is intensive and there are numerous submission and presentation deadlines that must be met.

With almost 50% of the credits going for continuous assessment, you will need to be on top of your game right from the start. To succeed, you will need to be self-motivated, develop good time management and excellent note taking and synthesis skills. Make use of all the resources and facilities that are available, attend the regular meetings with your project supervisor and, if you have any problems or issues with any part of the programme, speak with the lecturer concerned or call in to see me in my office.

*Andrew Jackson*  
Zoology Course Advisor

## Overview

Senior Sophister students in Zoology follow a programme that builds deep knowledge in specific subjects through a series of optional tutorial-style modules and

## Programme Structure

Zoology is the scientific study of all aspects of animal biology, from the cell to ecosystems. This encompasses a knowledge, not only of the structure and function of different species, but also of the complex relationships which govern the way in which animals relate to each other and to their surroundings. It provides an integrated view of all biological levels from the gene to the organism and higher.

Zoology provides fundamental knowledge relating to three areas of concern to society, namely the environment and its conservation, food production, and human and animal health and wellbeing. There is a growing awareness of environmental issues, including the conservation of biodiversity and the effects of climate change, to which zoologists contribute at all levels from research to policy making. Zoological research is also important in relation to food products and their pests while studies on a range of animals provide a basis for medical biology. Aspects of both environmental and medical biology feature strongly in the teaching and research programmes of the Zoology Department at TCD. With a breadth of skills, challenges and responsibilities, we are confident that everyone of the Trinity Graduate Attributes are met by the zoology sophister programme:

<https://www.tcd.ie/TEP/graduateattributes.php>

### *Learning Outcomes*

On successful completion of the two-year Sophister programme in Zoology, students will be able to:

- set out the important basic concepts and current research developments in animal biology and associated disciplines
- structure the diversity and evolution of the animal kingdom
- design useful experiments
- demonstrate technical competence in the handling of research facilities and operate safely in a laboratory environment, both individually and as a team member
- design sampling programmes and carry out fieldwork using standard procedures
- communicate effectively both orally and in a variety of contemporary scientific writing styles.
- use appropriate editing, web-based, graphical and analytical software to analyse and interpret data and prepare reports and assignments.
- critically analyse experimental results (including those obtained personally) and use appropriate statistical and other quantitative procedures for data handling
- proficiently search and critically assess scientific literature and databases

- apply a scientific approach to problem solving
- articulate the contribution, including the ethical dimension, made by Zoology to society, in the realms of the environment, agriculture, natural resource management, human behaviour and health.

## **ECTS Weighting**

The European Credit Transfer System (ECTS) is an academic credit system based on the estimated student workload required to achieve the objectives of a module or programme of study. It is designed to enable academic recognition for periods of study, to facilitate student mobility and credit accumulation and transfer. The ECTS is the recommended credit system for higher education in Ireland and across the European Higher Education Area.

The ECTS weighting for a module is a measure of the student input or workload required for that module, based on factors such as the number of contact hours, the number and length of written or verbally presented assessment exercises, class preparation and private study time, laboratory classes, examinations, clinical attendance, professional training placements, and so on as appropriate. There is no intrinsic relationship between the credit volume of a module and its level of difficulty.

The European norm for full-time study over one academic year is 60 credits. 1 credit represents 20-25 hours estimated student input, so a 10-credit module will be designed to require 200-250 hours of student input including class contact time, assessments and examinations.

ECTS credits are awarded to a student upon successful completion of the programme year. Progression from one year to the next is determined by the programme regulations. Students who fail a year of their programme will not obtain credit for that year even if they have passed certain components. Exceptions to this rule are one-year visiting students, who are awarded credit for individual modules successfully completed.

Senior Sophister students in Zoology take 40 credits of 'Core' Modules and 20 credits of 'Elective' Modules as follows: 20 Credits of 'Electives' chosen from a programme of tutorials and a Tropical Ecology Field Course, 10 credits of General Zoology, a 5 credit module of Data Handling, a 5 credit module of Research Comprehension, a 5 credit Zoology and Society Desk Study and a Research Project, which counts for 15 credits

## Contacts:

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Dr Andrew <b>JACKSON</b>	Associate Professor & Zoology Course Advisor	jacksoan	2728
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Dr Aoibheann <b>GAUGHRAN</b>	Teaching Fellow	agaughra	
Prof. Celia <b>HOLLAND</b>	Professor of Parasitology	cholland	1096
Dr Jacinta Kong	Research and Teaching Fellow	kongj	
Dr Pepijn <b>LUIJCKX</b>	Assistant Professor	luijckxp	1926
Prof. Nicola <b>MARPLES</b>	Professor	nmarples	1063
Dr Nessa <b>O'CONNOR</b>	Assistant Professor	n.oconnor	1640
Dr Marcin Penk	Research and Teaching Fellow	penkm	
Dr Jay <b>PIGGOT</b>	Assistant Professor	piggottjj	
Dr Nick <b>PAYNE</b>	Assistant Professor	paynen	1642
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Ms Sinead <b>KELLY</b>	Technical Officer	kellys76	3506
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Ms Fiona <b>MOLONEY</b>	Senior Executive Officer	fimolony	1366

Prof. Patrick <b>WYSE- JACKSON</b>	Head of School	wysjkn	2920
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## Summary of the Senior Sophister Programme

### Module Structure

<b>Zoology</b>	
<b>Semester 1 (S1)</b>	<b>Semester 2 (S2)</b>
<b>Core Modules</b>	
ZOU44030: Data Handling and Statistics. (5 credits)	ZOU44060: Research Comprehension (5 credits)
	ZOU44020 General Zoology (5 credits)
<b>Open Modules (5 ECTS each - choose 5)</b>	<b>Capstone Project</b>
ZOU44012: Advances in Parasitology ZOU44013: Conservation and Wildlife Management ZOU44019: Advances in Behavioural Ecology BOU44111: Restoration Ecology and Re-Wilding ZOU44092: Environmental Impact Assessment BOU44107: Plant Animal Interactions BOU44110: Evolution of plants and plant environment interactions (N.B. runs semester 2)	FBU44000: Research Project (20 credits)

Please note: Students are expected to make a contribution towards the transport and accommodation costs of the field components of module ZO4017 (based in the Rift Valley of Kenya), which is €1,760. Eligible students may apply to the Student Assistance Fund ([http://www.tcd.ie/Senior\\_Tutor/](http://www.tcd.ie/Senior_Tutor/)) for financial assistance.

## Brief Description of Senior Sophister Modules

*Where more than one lecturer is involved, the name of the module coordinator is given in italics*

### **CORE MODULES:**

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#### **ZOU44030 Data Handling**

(5 credits – Semester 1, Part 1 & 2)

##### **Module Personnel:**

*Dr Andrew Jackson*, *Dr Aoibheann Gaughran*

##### **Module Content:**

Being able to form research questions and challenge our hypotheses by collecting and analysing data forms the basis of scientific inquiry. An understanding of data analysis is an essential skill-set for all scientists. This module will consist of 2 tutorial sessions per week spanning all of semester 1. One of the tutorials each week will be used to develop class-directed questions relevant to current scientific thinking. As a class, we will form hypotheses, collect data and develop appropriate analytical techniques to answer our research questions. Concurrently, online material including video podcasts will be used to develop hands-on skills in the use of the very powerful and flexible statistics package R for data analysis. The module will start with basic probability theory, introduce different statistical distributions and culminate in learning how General Linear Models form a common framework for conceptualizing and analyzing your data. At the end of the module you will have analysed a wide variety of data types and will have used the transferable and widely applicable statistics package R to analyse your data.

##### **Learning Outcomes:**

On successful completion of this module, students will be able to:

1. Summarise and communicate quantitative results graphically and textually to scientific standards.
2. Apply appropriate statistical analyses of commonly encountered data types.
3. Explain the context of the analyses within a hypothesis driven framework of scientific logic.
4. Use the R statistical computing language for data analysis.
5. Create R notebooks for documenting analyses and sharing with collaborators.

##### **Assessment Details:**

100% continuous assessment.

## **ZOU44060 Research Comprehension**

(5 credits – Semester 1 & 2)

### **Module Personnel:**

*Dr Pepijn Luijckx*

### **Module structure:**

No matter what you do when you graduate, in most jobs you will be expected to read, understand and interpret data. Often this will be in a subject you are unfamiliar with, or will use unfamiliar methods or study organisms. The aim of this module is to help you to develop the ability to understand and interpret research from a broad range of scientific areas, and then to develop opinions about this research and how it fits into the “big picture”. This module also aims to improve your ability to communicate all kinds of scientific research to a general audience, a skill that is currently in great demand.

### **Learning Outcomes:**

1. Comprehend and report on scientific studies presented both orally and in primary literature.
2. Identify the aims and/or hypotheses in scientific studies and analyse the research methods employed to address them.
3. Interpret and generalise the results of the studies in the context of the wider subject area.
4. Assess and evaluate the conclusions of the scientific study.
5. Interpret graphical, tabular and pictorial representations of data and infer results in the context of the subject matter.
6. Summarise scientific studies in language and style suitable for consumption by a wide audience in an online form.

### **Assessment Component Breakdown**

40% CA, 60% Written Exam

**CA: A blog post:** A blog post will be written on the content of the seminars.

**Exam:** A series of questions on one or more unseen scientific papers (or parts of these papers) related to the seminar series that will test interpretation of scientific data, insight and critical thinking.

2 hours end of year written exam or a 48 hour take home exam depending on the Covid-19 situation.

Assessment for this module will take place entirely in Semester 2.

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## **ZOU44020 General Zoology**

(5 credits – Semester 2)

### **Module Personnel:**

*Dr Andrew Jackson, All Zoology Staff*

### **Module Content:**

This module provides an opportunity for students to revise and study, in greater depth, topics from the Junior Sophister Zoology programme. Students are expected to integrate their approach to this earlier material with the perspectives and skills they develop during their final year. Appropriate literature relating to the Junior Sophister mandatory modules will be recommended for detailed study.

### **Learning Outcomes\*:**

On successful completion of this module, students will be able to:

1. Describe the diversity and evolution of the animal kingdom.
2. Recognise, on the basis of diagnostic features, representatives of the major taxa of invertebrates and vertebrates.
3. Explain important basic concepts and current developments in such key areas of animal biology as ecology, comparative physiology, behaviour, parasitology and developmental biology.
4. State confidently the theoretical and practical aspects relating to essential laboratory techniques, particularly molecular approaches.

\*Note that under COVID restrictions for 2019-20 the learning outcomes had to be significantly adjusted and instead the module focused on researching and answering an essay question on one of a selection of topical concepts in zoology and society. A similar choice will have to be made for this module and this will be communicated to you clearly and definitively before the end of semester 1.

### **Assessment Details:**

In normal years this module is examined in a three-hour lab-based short answer paper in the final Moderatorship examination that is technically administered as CA. Under COVID restrictions last year it took the form of a 48 hour open book essay. A decision will be made before end of semester 1 as to how this module will and be assessed in semester 2.

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## **FBU44000 Research Project**

(20 credits – Semester 2)

### **Module Personnel:**

*Prof. Ian Donohue, All Zoology & Botany Staff*

### **Module Content**

The project provides an important opportunity for students to plan and carry out a detailed and original piece of scientific research and communicate the results. It culminates in the production of a thesis. Students are assigned to a member of staff who will support an appropriate topic and will supervise the work. They will submit a research proposal before the practical work begins. For the project, they will be expected to outline clearly a scientific problem, review the associated literature, design and execute an appropriate research programme, analyse and present the results and draw clear conclusions and record progress in a notebook (physical or electronic as appropriate). Detailed guidance notes on writing and submitting the thesis and poster may be found on the FBU44000 Blackboard site.

### **Learning Outcomes:**

On successful completion of this module, students will be able to:

1. Formulate scientific questions, apply a scientific approach to problem solving
2. Plan an investigation and utilise the principles of good experimental, observational or computational design
3. Conduct an in-depth scientific review of a subject
4. Organise desktop, computational, field- or laboratory-based research including: logistics, recording, archiving, qualitative or numerical analysis and presentation and interpretation of data
5. Manage a project through continuous assessment of progress and improvement of skills
6. Work effectively with a team including their supervisor and other members of the research team
7. Demonstrate technical competence in the handling of research facilities and operate safely in a computational, laboratory and/or field environment, both individually and as part of a team
8. Present and communicate their results in the form of a dissertation

### **Assessment Details:**

100% Continuous assessment: Thesis (18 ECTS credits), project proposal and associated documentation (2 ECTS credits)

## **OPEN MODULES: choose 5**

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### **ZOU44012 Advances in Parasitology**

(5 credits – Semester 1)

#### **Module Personnel:**

Prof. Celia Holland

#### **Module Content:**

This module consists of two parts. The first part (A) explores the significance and impact of parasitism upon humans. Some of the topics discussed during the module illuminate the practical challenges of designing and undertaking parasitological research in human subjects. In contrast, other topics highlight the relative merits of using animal model systems under experimental conditions as compared to field-based studies in human subjects. The topics are as follows - the impact of parasitism upon cognitive development in growing children; co-infection: challenges and solutions; epidemiology of helminths: aggregation and predisposition; the ultimate challenge - parasite control.

The second part (B) focuses upon more ecological aspects of Parasitology with a particular emphasis upon the impact of parasites at the level of the ecosystem and within wild animal hosts. The topics include parasites as ecosystem engineers, parasites and introduced species and the use of wild mammal host-parasite systems to model human parasitism.

#### **Learning Outcomes:**

On successful completion of this elective, the student will be able to:

1. Demonstrate familiarity with the conduct of human studies under field conditions in developing countries.
2. Describe the impact of parasitism upon human hosts.
3. Explore the pros and cons of using animal models in parasitological studies.
4. Delineate the mechanisms of interaction between co-infections.
5. Define parasite aggregation and predisposition.
6. Identify the challenges associated with anti-parasite chemotherapy and vaccination.
7. Evaluate the use of wild rodent parasite communities as models of human infection.
8. Demonstrate understanding of the role of parasites in an ecosystem.
9. Assess the role of introduced host species in parasite transmission.
10. Demonstrate the skills to critique a scientific paper.
11. Discuss and debate various contributions to a particular topic.

#### **Assessment Details:**

This module is assessed 30% by continuous assessment and 70% by questions on an annual examination paper.

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## **ZOU44013 Conservation and Wildlife Management**

(5 credits – Semester 1)

### **Module Personnel:**

Prof. Ian Donohue, Dr John Rochford, Prof. Peter Wilson

### **Module Content:**

This module, which consists of both lectures and tutorials, looks at some of the practical applications of wildlife biology to the conservation and management of animals, both *in-* and *ex-situ*, including the role of zoos in captive breeding programmes. Among the topics covered are: planning for wildlife management, wildlife survey and census techniques, the principles of managing wildlife for sustainable harvest or control, management of scarce or endangered species, practical issues associated with the *ex-situ* management of species, and the design and management of conservation areas. In the second part of the module, we will concentrate on anthropogenic impacts on biodiversity conservation, including the development and implementation of biodiversity conservation strategies in the wake of the Convention on Biological Diversity, other national and international wildlife legislation, biosecurity and the role of Invasive Alien Species, Biological Data Management and the development of Species Action Plans, and the role of reintroductions in biodiversity conservation.

### **Learning Outcomes:**

On successful completion of this elective, the student will be able to:

1. outline the goals and history of sustainable wildlife management
2. determine and evaluate strategies for exploitation and control of animal resources
3. implement techniques for establishing and maintaining the conservation status of species
4. describe the relationship between *in-* and *ex-situ* conservation measures
5. evaluate the selection, design and management of protected areas for wildlife

### **Recommended Reading List:**

Primack, Richard B. 2010. Essentials of Conservation Biology (5<sup>th</sup> edition).

Publisher – Sinauer Associates, Sunderland, Mass. (ISBN 9780878936403)

Groom, Martha J., Meffe, G.K. and Carroll, C.R. 2006. Principles of Conservation Biology (3<sup>rd</sup> edition). Publisher – Sinauer Associates, Sunderland, Mass. (ISBN 0878935185)

### **Assessment Details:**

This module is assessed 50% by continuous assessment and 50% by questions on an annual examination paper.

## **ZOU44019 Advances in Behavioural Ecology**

(5 credits – Semester 1)

### **Module Personnel:**

Dr Nicola Marples

### **Module Content:**

This module will expand the students' grasp of some classic topics in the field of behavioural ecology such as the consequences of group living, optimality models, animal culture and signaling. We will also explore some currently advancing themes, including multi-level societies, co-operation, and the effects of urbanization on animal behaviour. The content will be delivered using a fully flipped classroom format of worksheets leading to recorded lectures and independent reading followed by structured discussions. The continuous assessment will be in two parts. The first will involve the students undertaking group research into the evidence for empathy in animals and presenting their findings to the class, receiving a group mark. The second will involve writing a blog on a paper of their choice taken from one of the leading behavioural journals, which will be individually assessed.

### **Learning Outcomes:**

On successful completion of this elective, the student will be able to:

1. Discuss the foundations of modern behavioural ecology supported by appropriate experimental examples
2. Appreciate the uses of theoretical modelling and sound experimental design in the study of animal behaviour.
3. Present reasoned arguments on a wide range of currently developing topics, based on the literature and their own conclusions.
4. Have experience of reading, summarising and presenting primary literature to the class.
5. Work in a group to support each other's learning and understanding.
6. Have experience of writing a blog suitable for presentation of scientific ideas to social media audiences.

### **Assessment Details:**

This module is assessed 30% by continuous assessment and 70% by essay questions on an annual examination paper.

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## **ZOU44092 Environmental Impact Assessment**

(5 credits – Semester 1)

### **Module Personnel:**

*Prof. Ian Donohue, Dr John Rochford*

### **Module Content:**

This module involves an introduction to the principles and processes of Environmental Impact Assessment, particularly in relation to national and international requirements. All stages of the EIA process, from initial project screening to the final review, are covered, with the emphasis throughout on the role of the natural scientist. Strategic Environmental Assessment is also briefly covered. In addition to the lectures, students carry out a scoping exercise for a proposed development and conduct a quality review of an actual EIS.

### **Learning Outcomes:**

On successful completion of this module students will be able to:

1. Outline the development of the Environmental Impact Assessment process as a management and legislative tool from its inception in the 1960s to its present form.
2. Explain the stages in the process from initial screening to post-project monitoring and auditing.
3. Conduct a scoping exercise for a project and produce a draft Scoping Statement.
4. Critically evaluate Environmental Impact Statements prepared for a wide range of projects.
5. Compare and contrast the process of Environmental Impact Assessment with Strategic Environmental Assessment.
6. Describe Appropriate Assessment in the context of Natura 2000 sites.

### **Assessment Details:**

This module is assessed 50% by continuous assessment and 50% by questions on an annual examination paper.

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## **BOU44107 Plant Animal Interactions**

(5 credits – Semester 2)

### **Module Personnel:**

Dr Jane Stout, Dr Aoibheann Gaughran

### **Module Content:**

In the Origin of Species (1859) Darwin emphasized that “plants and animals, most remote in the scale of nature, are bound together by a web of complex relations”. Plant-animal interactions have become increasingly recognized as drivers of evolutionary change and important components of ecological communities. This module will focus on pollination (the transfer of pollen between male and female reproductive structures in flowers) and herbivory (the consumption of plants by animals). The first half of the module will focus on plant-pollinator interactions, including pollinator-mediated evolution of floral traits, community level interactions, pollinator decline and conservation. The second part of the module will focus on antagonistic interactions between plants and herbivores, and explore plant and animal adaptations to herbivory, plant-herbivore dynamics and applications of interactions to ecosystem management. Practicals will investigate floral characteristics and adaptations for pollination, pollinator networks and plant and animal adaptations to herbivory.

The aims of the module are:

To promote your understanding of pure and applied ecology and evolution of plant-animal interactions

To equip you with the basic skills for carrying out laboratory and field experiments to examine plant-animal interactions.

### **Learning Outcomes:**

On successful completion of this elective, the student will be able to:

1. Synthesise and summarise aspects of the ecology and evolution of mutualistic and antagonistic plant-animal interactions, from individuals to communities, interactions between native and alien species, and applied issues.
2. Carry out laboratory work investigating pollination syndromes, plant-pollinator interaction networks and plant and animal adaptations to herbivory, and analyse and interpret data collected.
3. Work as a team to obtain, organise and present material on current topics in the field.

### **Assessment Details:**

This module is assessed 50% by continuous assessment and 50% by questions on an annual examination paper.

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## ***BOU44110: The Evolution of Plants and Plant-Atmosphere Interaction***

(5 credits – Semester 2)

### ***Module Personnel:***

***Jennifer McElwain***

### ***Module Content:***

We are currently experiencing major changes in our climatic and atmospheric environment. Conservative estimates project that the concentration of greenhouse gas carbon dioxide will double by the end of this century and global temperatures are expected to rise by 1 to 4 degrees C. A major issue facing the scientific and political community is understanding how these projected changes will influence natural ecosystems, plant and animal ecology and biodiversity. This module will explore the evolution of plants in the context of long-term changes in climate and atmospheric composition. Examples of plant-atmosphere and plant-climate interactions in the deep geological past will be examined in addition to modern experimental studies. The course will provide a framework for understanding the nature and scale of evolution, adaptation and ecophysiological responses of plants to their atmospheric and climatic environment over the past 500 million years of Earth history. Continual assessment will be through a programme of tutorials and student reviews of primary research papers linked to lectures:

### ***Assessment Details:***

This module is assessed 70% by Examination and 30% by Continuous Assessment.

### ***Learning outcomes:***

On successful completion of this module students should be able to:

1. To describe plant evolution over the past 3,700 million years (with specific emphasis on land plant evolution over the past 500 million years based on the fossil plant record)
2. To evaluate fossil plant responses to environmental extremes associated with mass extinction events in Earth history
3. To describe how plant evolution influences the long-term carbon cycle, climate and atmospheric composition
4. To understand global, regional, local and individual level plant responses to past changes in climate and atmospheric composition
5. To use knowledge of plant-atmosphere responses in the deep geological past to evaluate the threat of ongoing anthropogenic global change

## **BOU44111 Restoration Ecology & Re-wilding**

(5 credits – Semester 1)

### **Module Personnel:**

*Marcus Collier*

### **Module Content:**

Restoration ecology, like conservation biology, is a 'crisis' discipline, having emerged as a science/practice response to the social and ecological impacts directly and indirectly driven by human activities. Restoration ecology has proven to be highly effective in some cases but has also given rise to some controversy as well as policy difficulties. Rewilding and novel ecosystems are new and controversial areas within restoration ecology making it difficult to know how and when to intervene. This module will introduce you to the challenges and opportunities, failings and fallacies of the complex world of restoration ecology, rewilding, and the work of restoration ecologists. It will look at how rewilding could be the most efficient of nature-based solutions and asks if this is feasible in the modern world. As the discipline struggles to navigate global climate issues, integrate with the social sciences, incorporate politics and economics, and derive policy actions, this module will draw on case studies of restoration globally and will challenge students to rethink ecology and ecosystems in the Anthropocene. It will also discuss areas of employment where students might consider after graduation, with some invited guests providing insight into the practice of restoration and rewilding.

### **Learning Outcomes:**

On successful completion of this elective, the student will be able to:

1. Understand the principals of restoration ecology and rewilding as they apply in a modern context
2. Comprehend the nuanced nature of restoring ecosystems and habitats as well as re-introducing species in practice
3. Carry out restoration case study analysis for their assignments
4. Understand the complex relationship between ecology, social values and policies
5. Evaluate the success of restored ecosystems and species

### **Assessment Details:**

This module is assessed 100% by continuous assessment.

### **Recommended Reading:**

Aronson, J, Milton, S.J., & Blignaut, J. Eds. (2007) *Restoring Natural Capital*. Island Press

Hobbs, R. J., Higgs, E. S. & Hall, C. M. Eds. (2013) *Novel Ecosystems*. Wiley

Marris, E. (2011) *Rambunctious Garden*. Bloomsbury

Monbiot, G. (2015) *Feral*. Penguin

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## Programme Regulations

### Assessments and Award

The assessment value is based on the ECTS credit value of the modules concerned. Your performance will be assessed by Continuous Assessment and Written Examination, and an interview (*Viva voce*) may be requested by the external examiner.

The following modules are assessed 100% by Continuous Assessment:

Module Co	Module Name	ECTS Credits	EX	CA
<b>CORE MODULE</b>				
ZOU44030	Data Handling	5		100%
FBU44000	Research Project (Thesis and Presentation)	20		100%

All of the remaining modules are assessed, at least in part, by examination.

Module Code	Module Name	ECTS Credits	EX	CA
<b>CORE MODULE</b>				
ZOU44020	General Zoology	5		100%
ZOU44060	Research Comprehension	5	60%	40%
<b>ELECTIVE MODULE</b>				
ZOU44012	Advances in Parasitology	5	70%	30%
ZOU44013	Conservation and Wildlife Management	5	50%	50%
ZOU44019	Advances in Behavioural Ecology	5	70%	30%
ZOU44092	Environmental Impact Assessment	5	50%	50%
BOU44107	Plant Animal Interactions	5	50%	50%
BOU44110	Evolution of plants and plant environment interactions	5	70%	30%
BOU44111	Restoration Ecology & Re-wilding	5		100%

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## Programme Regulations

### Assessments and Award

The assessment value is based on the ECTS credit value of the modules concerned. Your performance will be assessed by Continuous Assessment and Written Examination, and an interview (*Viva voce*) may be requested by the external examiner.

The following modules are assessed 100% by Continuous Assessment:

Module Co	Module Name	ECTS Credits	EX	CA
<b>CORE MODULE</b>				
ZOU44030	Data Handling	5		100%
FBU44000	Research Project (Thesis and Presentation)	20		100%

All of the remaining modules are assessed, at least in part, by examination.

Module Code	Module Name	ECTS Credits	EX	CA
<b>CORE MODULE</b>				
ZOU44020	General Zoology	5		100%
ZOU44060	Research Comprehension	5	60%	40%
<b>ELECTIVE MODULE</b>				
ZOU44012	Advances in Parasitology	5	70%	30%
ZOU44013	Conservation and Wildlife Management	5	50%	50%
ZOU44019	Advances in Behavioural Ecology	5	70%	30%
ZOU44092	Environmental Impact Assessment	5	50%	50%
BOU44107	Plant Animal Interactions	5	50%	50%
BOU44110	Evolution of plants and plant environment interactions	5	70%	30%
BOU44111	Restoration Ecology & Re-wilding	5		100%

Assessments **MUST** be handed in on time. Work submitted after the due date **WILL** have marks deducted at the rate of 5% of the marks, per day, unless good cause (e.g. medical certificate) is provided. Assessments received one week or more after the due date will receive no mark. **ALL** components of Continuous Assessment must be submitted for assessment unless with prior agreement with the module coordinator. This is essential as missing CA work is recorded automatically with a code indicating "AB – absent without permission" and the grades for that modules are withheld meaning progression to the next year or graduation, in the case of Senior Sophister, is not applied.

The assessment for ZOU44020 (General Zoology) is a 3 hour paper (a short-answer 'spot-test' paper). All other examinations are 1.5 to 2 hours long. Further information about the form of the examination papers will be provided as part of the introduction to each module, again, closer to the date of the exams.

The Senior Sophister examinations (assessments and papers) form Part 2 of the examinations for the Moderatorship in Zoology, contributing 80% to the overall degree award, with the remaining 20% coming from the Junior Sophister examinations. The Harmonized Assessment and Progression Regulations (Model 2), as adopted by Council in 2012, shall apply to all examinations in Zoology.

Past examination papers can be viewed at:

<https://www.tcd.ie/academicregistry/exams/past-papers/annual/>

The Junior Sophister examinations (assessments and papers) form Part 1 of the examinations for the Moderatorship in Zoology, contributing 20% to the overall degree award, with the remaining 80% coming from the Senior Sophister examinations. The [Harmonized Assessment and Progression Regulations](#) (Model 2), as adopted by Council in 2012, applies to all examinations in Zoology.

Honours degrees in College are governed by a Court of Examiners that includes an external examiner who is a senior academic in a comparable institution. During the ratification of our examination procedures the external examiner will call a selection of students for an in viva voce examination (oral examination) that lasts typically 10 – 20 minutes. Students also have the right to request a viva voce exam. While attendance at this examination is not mandatory, it is strongly recommended that you make yourself available and attend if called. The exact dates and times for these examinations will not be known until closer to the time when the court of examiners meeting is scheduled but it is likely to be the last week of the marking results period as per the University's published academic year structure.

### **Access to Scripts (*Freedom of Information Act*)**

Following publication of the final examination results, students may have access to their examination scripts upon written application to the Head of Discipline or Course Coordinator.

## Plagiarism

Plagiarism is **academic fraud** and, as such, is an offence against University discipline. The University considers plagiarism to be a **major** offence, and subject to the disciplinary procedures of the University.

In order to support students in understanding what plagiarism is and how they can avoid it, an **online central repository**, to consolidate all information and resources on plagiarism, has been set up and can be accessed at <http://tcd-ie.libguides.com/plagiarism>

## Appeals Policy

Trinity College Dublin, the University of Dublin, herein referred to as Trinity, recognises that in the context of its examination and assessment procedures, a student may wish to appeal a decision made in relation to their academic progress. The appeals procedure may be used only when there are eligible grounds for doing so and may not be used simply because a student is dissatisfied with the outcome of a decision concerning their academic progress. Further information can be accessed at <http://www.tcd.ie/teaching-learning/assets/pdf/academicpolicies/Appeals Policy.pdf>

## Grading Guidelines

The following guidelines are used when awarding grades for essays and examination answers in the Sophister years in Zoology

Class	Mark Range	Criteria
I	90-100	<b>EXCEPTIONAL ANSWER;</b> This answer will show original thought and a sophisticated insight into the subject, and mastery of the available information on the subject. It should make compelling arguments for any case it is putting forward, and show a rounded view of all sides of the argument. In exam questions, important examples will be supported by attribution to relevant authors, and while not necessarily giving the exact date, should show an awareness of the approximate period. In essays, the referencing will be comprehensive and accurate.
	80-89	<b>OUTSTANDING ANSWER;</b> This answer will show frequent originality of thought and make new connections between pieces of evidence beyond those presented in lectures. There will be evidence of awareness of the background behind the subject area discussed, with evidence of deep understanding of more than one view on any debatable points. It will be written clearly in a style which is easy to follow. In exams, authors of important examples may be provided. In essays all important examples will be referenced accurately.
	70-79	<b>INSIGHTFUL ANSWER;</b> showing a grasp of the full relevance of all module material discussed, and will include one or two examples from wider reading to extend the arguments presented. It should show some original connections of concepts. There will be only minor errors in examples given. All arguments will be entirely logical, and well written. Referencing in exams will be sporadic but referencing should be present and accurate in essays.
II-1	65-69	<b>VERY COMPREHENSIVE ANSWER;</b> good understanding of concepts supported by broad knowledge of subject. Notable for independent synthesis of information rather than originality. Evidence of relevant reading outside lecture notes and module work. Mostly accurate and logical with appropriate examples. Occasionally a lapse in detail.

	60-64	<b>LESS COMPREHENSIVE ANSWER;</b> mostly confined to good recall of module work. Some independent synthesis of information or ideas. Accurate and logical within a limited scope. Some lapses in detail tolerated. Evidence of reading assigned module literature.
II-2	55-59	<b>SOUND BUT INCOMPLETE ANSWER;</b> based on module work alone but suffers from a significant omission, error or misunderstanding. Usually lacks synthesis of information or ideas. Mainly logical and accurate within its limited scope and with lapses in detail. The content is sensible and relates a reasonable narrative, if limited in synthesis and sophistication. There is reasonably good citation practice and a well presented reference list in essays.
	50-54	<b>INCOMPLETE ANSWER;</b> suffers from significant omissions, errors and misunderstandings, but still with understanding of main concepts and showing sound knowledge. Several lapses in detail. Content may be disjointed and lacking good structure. Poor citation practice and reference list in essays.
III	45-49	<b>WEAK ANSWER;</b> limited understanding and knowledge of subject. Serious omissions, errors and misunderstandings, so that answer is no more than adequate.
	40-44	<b>VERY WEAK ANSWER;</b> a poor answer, lacking substance but giving some relevant information. Information given may not be in context or well explained, but will contain passages and words, which indicate a marginally adequate understanding.
F-1	30-39	<b>MARGINAL FAIL;</b> inadequate answer, with no substance or understanding, but with a vague knowledge relevant to the question.
F-2	0-29	<b>UTTER FAILURE;</b> with little hint of knowledge. Errors serious and absurd. Could also be a trivial response to the misinterpretation of a question.
U.G		Ungraded

The following guidelines are used Project/Dissertation Assessment in Zoology.

Class	Mark Range	Criteria
I	80-100	Exceptional project report showing deep understanding of the topic and literature similar to that expected in a published paper. Clear grasp and expression of the justification for the research, with clear explanation of the importance and implications of the work within the subject area. Methods described with the clarity and detail expected in a published paper, showing sound experimental design. Excellent presentation, analysis and exploration of results focussed on the question asked, using the most appropriate analyses for the question and data. Thoughtful, critical evaluation of the findings, discussed insightfully in their full context within the literature. Excellent presentation of the finished thesis, which contains very few, if any editorial errors.
	70-79	A very good project report showing evidence of wide reading, with clear presentation and thorough analysis of results and an ability to critically evaluate and discuss research findings. Clear indication of some insight and originality. A very competent and well-presented report overall but falling short of excellence in each and every aspect.
II-1	65-69	A very good project report, showing a reasonably wide understanding of the topic and its associated literature, with some indication of how the research adds to the field. Methods described clearly and in sufficient detail for someone to repeat the work, and showing sound experimental design, or the appreciation of how it could have been made sound. Competent analysis of the results and valid and accurate interpretation of the findings. Results presented accurately using appropriate figures and/or tables. Accurate appreciation of any shortcomings of the experimental design and the implications for interpretation. Discussion of the results puts them into some level of context but may not reflect all the implications for the research field.
	60-64	A good project report, showing some understanding of the wider topic and its associated literature, with some indication of the relevance of the research. Methods described clearly, though perhaps not in sufficient detail for someone else to repeat the work. Sound experimental design, or some appreciation of how it could have been made sound. Competent analysis of the results, though perhaps through the use of simpler tests than would be ideal. Accurate presentation of results, though perhaps not with the best choice of graphics. Interpretation of findings mostly valid and accurate. Some appreciation of any major shortcomings in experimental design and the implications for interpretation. Discussion may focus mostly on the findings, with only occasional references to other work, though those contextual references should be present.

II-2	50-59	A moderately weak project report which shows some understanding of the research question, but lacks a strong grasp of the wider research topic or the relevance of the project. Methods mostly described clearly, but there may be lapses in detail. Experimental design may not be entirely sound, and any weakness may be undescribed. Analysis of the results generally sound but may be simple and contain errors such as incorrect statistical reporting or the use of less than ideal graphs. Interpretation of the findings may not be entirely accurate, and shortcomings in the design or analysis unlikely to be taken into account during interpretation, but some level of interpretation of the results must be present. Discussion may focus solely on the findings of the work, and may lack references to other work, though some indication of the relevance of the project should be present. Insufficient attention paid to organisation and presentation of the report.
III	40-49	A weak project showing only limited understanding of the research question, reported without understanding of the wider context or relevance of the project. Methods not complete. Experimental design may contain obvious unrecognised flaws and may not be described completely. Analysis of results simple and may show basic errors. Interpretation of results may be limited or absent. Discussion may be minimal and restricted to the direct findings of the project. General standard of presentation poor.
Fail	20-39	An unsatisfactory or incomplete project report, lacking sections or with little content in some. Very limited understanding of the question or failure to express it at all. Methods may be incomplete, possibly lacking description of experimental design. Results may be incomplete, with poor choice of graphics and / or tables. Analysis of data may be lacking or contain fundamental errors. Interpretation of the results likely to be limited or absent. Discussion restricted to a restatement of results. Very poor overall standard of presentation.
	0-19	An extremely poor project report containing very little substance and showing no real understanding or awareness of the problem. No attempt at a relevant literature review or relevant support from published work. Methods chaotic or incomprehensible. Almost absent or completely absent presentation of results. Any analysis of results incorrect or inappropriate. Clear inability to interpret results in relation to other work or ideas. Very poor overall standard of presentation.

## Prizes in Zoology

A candidate who has shown exceptional merit at the degree examination may be awarded a **Gold Medal** by the Board of College on the nomination of the examiners.

Other College prizes relevant to the Zoology Moderatorship are:

### ***E.A. Collen Prize in Zoology***

The prize was founded in 1990 by a bequest from Mrs E.A. Collen. The income from the fund is awarded annually to a student who has completed a Moderatorship in Zoology and has been accepted by Trinity College as a candidate for a higher degree. It is intended to encourage research in Zoology and is awarded on the recommendation of the Head of Discipline. *Value €115.*

### ***Maureen de Burgh Memorial Prize in Marine Biology***

The prize was established in 1986 by subscription in memory of Dr Maureen de Burgh, a former member of the department, to promote research in marine biology. It is awarded annually to a postgraduate or undergraduate student to cover expenses related to research in marine biology at Trinity College, on the recommendation of the Professor of Zoology and one other lecturer in the department. *Value €140.*

### ***W.C. Campbell Moderatorship Prize in Zoology***

This prize was established in 2017 by a gift from Professor William C. Campbell from his 2015 Nobel prize in Physiology or Medicine, which was awarded for discoveries concerning a novel therapy against infections caused by roundworm parasites. The gift is a token of gratitude for Prof. Campbell's undergraduate education in the Natural Sciences, and for the inspiring mentorship of Dr. James Desmond Smyth of the Zoology Department. It is awarded annually to a student with the best overall Moderatorship result in Zoology. *Value, €200.*

### ***W.C. Campbell Undergraduate Research Prize in Zoology***

This prize was established in 2017 by a gift from Professor William C. Campbell from his 2015 Nobel prize in Physiology or Medicine, which was awarded for discoveries concerning a novel therapy against infections caused by roundworm parasites. The gift is a token of gratitude for Prof. Campbell's undergraduate education in the Natural Sciences, and for the inspiring mentorship of Dr. James Desmond Smyth of the Zoology Department. It is awarded annually to an undergraduate student with the best overall undergraduate research project result in Zoology. *Value, €200.*

## General Information

### Work Stations

For your project you will be working in the field, the aquarium or laboratory of your supervisor, in association with a number of postgraduates. Tutorials are generally held in the Auk Room in the Zoology building.

### Health and Safety

The **Safety, Health and Welfare at Work Act 2005** places legal responsibility on students to take care of their own safety and that of others around them. The Medical Declaration forms signed in Junior Freshman year stated your agreement to abide by College's safety policies. These policies cover work in the laboratory, the field and all activities on campus. You must read the Faculty of Engineering, Mathematics and Science Health and Safety Guidance Manual to inform yourself of these procedures, which can be found on the Faculty local home page at: <https://ems.tcd.ie/local/>

Most practical classes for Junior Sophister Zoology are held in BIOLAB1, 2 or 3 in the Biology Teaching Centre. Practical work for ZO3003, using the Zoological Collections, is carried out in the Zoology Museum. Specific safety issues relating to the teaching laboratories will be explained to you before you commence practical work. These will include information on chemical, biological, mechanical and fieldwork hazards. If you are unsure of any aspect of safety, it is your duty to ask questions until you fully understand the risks and the protections in place to mitigate them.

Fire drills are held regularly. On hearing a fire alarm you must listen to all instruction given and gather at the Assembly Point until you are permitted to return to the building. Do not bring your belongings or ignore the alarm. This may delay your exit from the building.

The Discipline of Zoology has further health and safety information important to you on its local access page at: <https://www.tcd.ie/Zoology/local/> If you have any questions regarding Safety, Health or Welfare please contact [Zoosafe@tcd.ie](mailto:Zoosafe@tcd.ie)

### Emergency Procedure

In the event of an emergency, **dial Security Services on extension 1999 (+ 353 1 896 1999).**

Security Services provide a 24-hour service to the College community, 365 days a year. They are the liason to the Fire, Garda and Ambulance services and all staff and students are advised to always telephone extension 1999 (+ 353 896 1999) in case of emergency.

Should you require any emergency or rescue services on campus, you must contact Security Services. This includes chemical spills, personal injury or first aid assistance.

It is recommended that all students save at least one emergency contact in their phone under ICE (In Case of Emergency).

## **Data Protection**

Trinity College Dublin uses personal data relating to students for a variety of purposes. We are careful to comply with our obligations under data protection laws and we have prepared this short guide to ensure you understand how we obtain, use and disclose student data in the course of performing University functions and services. More information is available at [https://www.tcd.ie/info\\_compliance/data-protection/student-data/](https://www.tcd.ie/info_compliance/data-protection/student-data/)

## **Student Support**

There are many support services available in College including Tutor Services, Mature Student Office, Equality Officer, Day Nursery, Health Services etc... Information on these and how to access them is available on the consolidate Student Supports and Services page <https://www.tcd.ie/students/supports-services/>

## **Students Union**

“The Students’ Union is run for students by students. We represent you at college level, we fight for your rights, we look after your needs, and we are here for you to have a shoulder to cry on or as a friend to chat with over a cup of tea. As a student of Trinity College, you are automatically a member of TCDSU. Remember – we work for you, so if you think we should be focusing on a particular issue, get in touch! The Students’ Union website is a vital resource for Trinity students. It’s the place to go if you have a problem in College - it has information on accommodation, jobs, campaigns, as well as information pertaining to education and welfare. The website also contains contact details for each Sabbatical Officer. To stay in touch through social media, find us on Facebook at ‘Trinity College Students’ Union’ to keep up to date with what we’re doing. You can also follow us on Twitter @TCDSU.”

More information is available at <https://www.tcdsu.org>

## **Illness/Disability**

Issues regarding welfare and wellbeing are best brought to your tutor’s attention or to the College Health Service. Students with a medical condition or disability that is likely to impair their performance in courses or examinations (e.g. asthma, dyslexia,

etc.) are encouraged to inform the Zoology Moderatorship Coordinator, in confidence. Please be aware of, and use where necessary, the various student support services in College. Information relating to all support services is available at: <http://www.tcd.ie/students/supports-services/> Medical certificates, LENS reports, etc. should be lodged, at the time of issue, with your Tutor, and copies submitted to the Executive Officer in the Zoology Department Office as appropriate.

## Co-curricular Activities

Co-curricular and extra-curricular activities are an important part of life and development. There are many societies and sports clubs available in College and you are encouraged to engage with these to maintain a healthy work-life balance. More information is available at <http://trinitysocieties.ie> and <https://www.tcd.ie/Sport/student-sport/ducac/>.

## Absence from College

Absence from College – Medical and Absence Certificates. Zoology, Botany and Environmental Science employs an approach similar to the Fresh years as administered by the Science Course Office.

### Medical Certificates/Absence due to illness

Where a student misses an assigned laboratory practical class through illness, they should **(a)** submit a Medical Certificate to the Zoology teaching office **on the day of their return to College** and **(b)** inform the laboratory practical supervisor of their absence at the next session.

Science **Medical Certificate** Form (**use with med cert from doctor**) – Available from Zoology office

### Self-Certification/Absence due to illness - three days or less

For periods of illness of **three days or less** (but **no more than seven days in any year**) a student may 'self-certify' their illness on the forms supplied, again to the Zoology teaching office on the day of their return to College.

Science **Medical Self Certification** Form (**use for 3 days med not covered by doctor**) – Available from the Zoology teaching office.

### Other Absences

Students who require to be absent from a laboratory practical classes or tutorials (with or without an associated assessment) for any other reason, such as a sporting event or other situation, should inform the Zoology teaching office and zoology course convenor well in advance of the event (preferably a week beforehand).

Science Absence from College Form, **Sport or Other** – Available from the Zoology teaching office Please note that filling in this form is **not a guarantee** that you will be afforded any accommodations with regard to marks or assignment of an alternative lab or tutorial session. In such cases decisions on what action/accommodations will be given is purely at the discretion of the individual disciplines concerned. The Zoology teaching office and course convenor do not have any jurisdiction in this situation.

**Students who will not be in attendance for any extended duration during term time must have permission from Senior Lecturer via their tutor to be absent from College. Please refer to the absence regulations noted in the previous page.**

Excuses for absence, presented after the event, **will not be entertained.** Students who anticipate that their sporting commitments may necessitate more than the occasional absence from College (e.g. Sport Scholars, etc.) should discuss their situation with their tutor, and the zoology course convenor.

**NOTE:**

Please note that these regulations do not apply to absence from examinations. Students who are absent from examinations must contact their tutor as a matter of urgency and present any medical information/documentation to them.

## **Research Ethics**

In line with Trinity College Dublin's Policy on Good Research Practice, all research in the School of Natural Sciences (SNS) should be conducted according to the overarching ethical principles of "respect for the individual subject or population, beneficence and the absence of maleficence (research should have the maximum benefit with minimal harm) and justice."

All individuals involved in research should facilitate and ensure research is conducted ethically. Ethical conduct in research is a shared responsibility. Primary responsibility rests with the Principal Investigator(s). Ethical responsibilities and legal obligations may overlap. All staff and students conducting research are required to ensure that their research is carried out in compliance with this policy. Ethical review is required before any studies involving human subjects, other living organisms and/or the natural environment, encompassing biosphere, geosphere, hydrosphere and atmosphere, commence. This requirement applies to staff, postgraduate and undergraduate students and volunteers/interns. Field- and laboratory work cannot commence until ethical review has been completed and approval has been gained. Staff or students planning to undertake research should complete the Research Ethics Application available from <https://naturalscience.tcd.ie/research/ethics/>

## **The Zoological Society**

A number of societies run by students, and affiliated to the Central Societies Committee, cover interests relevant to students in Zoology, the most important of which is the Dublin University Zoological Society.

ZOOSOC <http://trinitysocieties.ie/society/?socid=120> was founded in 1974 and promotes an awareness of all aspects of zoology and natural history. It holds regular meetings and field trips, and its members have participated in numerous wildlife surveys and fundraising campaigns.