



# BIOL114

## Evolution and Biodiversity

S1 External 2014

*Dept of Biological Sciences*

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## General Information

Unit convenor and teaching staff

Unit Convenor

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Credit points

3

Prerequisites

Corequisites

Co-badged status

Unit description

This unit introduces students to the essential concepts in current biology. The unit forms the first step for students pursuing a career in the biological sciences, and provides a basis for students in other disciplines who wish to maintain an interest in this dynamic field. The theme of this unit is evolution. The first part of the unit is concerned with the origin of life and discusses current theories on how life may have arisen on a previously lifeless planet. We discuss evolutionary theory in detail including some of the genetic principles that underlie evolution. In the second part we introduce the major groups of organisms examining their diversity and how they function. In the final part we discuss the ecological interactions between organisms from the small scale to global patterns. Throughout the unit, these core concepts are illustrated with examples from current research. This unit is designed as a companion unit to BIOL115.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

Define the processes of evolution

Describe the major morphological characteristics of the main groups of organisms and

compare and contrast their biology

Develop falsifiable hypotheses and design experiments to test them

Test a hypothesis by collecting and analysing appropriate data

Effectively communicate biology using written and oral media

Locate and critically assess scientific literature

Use digital microscopy technology to successfully visualise specimen

## Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Weekly Activities</u>	5%	No	Weekly
<u>Skills tests</u>	3%	No	Variable
<u>Oral presentation</u>	5%	No	Prac 5
<u>Midsemester test</u>	15%	No	Intrl: Apr11th, Extrl: Apr15th
<u>Scientific journal article</u>	22%	No	Intrl: May 16, Extrl: May 23
<u>Final exam</u>	50%	No	TBA

### Weekly Activities

Due: **Weekly**

Weighting: **5%**

The Weekly Activities are accessible through iLearn and are designed to keep you up to date with the unit material and prepare you for assessments and Practicals. Weekly Activities are open for the week they are due as well as for one week prior to the week they are due (two weeks total). You have the option of two attempts and your mark will be the average of both. **Due every week!**

**Note the Weekly activities have two components:**

Component 1: **Weekly quizzes:** Multiple-choice quizzes based on content (2.5% calculated from the number of correct answers)

Component 2: **Weekly tasks:** Small tasks to help with understanding how science is communicated (2.5% calculated from the number of tasks completed).

On successful completion you will be able to:

- Define the processes of evolution
- Describe the major morphological characteristics of the main groups of organisms and compare and contrast their biology
- Develop falsifiable hypotheses and design experiments to test them
- Test a hypothesis by collecting and analysing appropriate data
- Effectively communicate biology using written and oral media

## Skills tests

Due: **Variable**

Weighting: **3%**

**Employers want to know students have a proficiency in a range of practical skills. Every second practical there will be a short skills test. They will range from how to search for scientific articles, how to set-up a microscope, how to apply the scientific method, how to plot data in excel, to how to interpret phylogenies. All skills tests will be based on skills that you have learnt in earlier practical's. You will have a time limit to complete the task. During that time you can attempt the task as many times as you like until the tutor agrees the task has been completed satisfactorily. The mark will be on a pass/fail basis. For some items if you fail you will be excluded from using the apparatus until you show competency.**

On successful completion you will be able to:

- Locate and critically assess scientific literature

## Oral presentation

Due: **Prac 5**

Weighting: **5%**

**Group activities are not students favour activities but they are very important. It is very rare in the workplace that you find yourself working in isolation. Instead you are more likely to be working as a team. As a group of four you will present a scientific journal article from PLoS ONE using powerpoint slides to a small group of students during the Practical. This exercise is designed to help you develop your communication skills and for you to critically assess scientific literature. The presentation will be prescribed as follows: Individual 1 will brief us on the topic area of the research; Individual 2 will give us background to why the experiment is being done and the hypothesis and predictions; Individual 3 will present one of the major results of the paper, in their description they must provide what was done to get the result; and finally individual 4 will present how did their findings compare with the predictions made by the researcher and how this research compared with others. Each individual in the group will talk for 2 minutes. Your tutor will assess you and you will receive written feedback on your presentation style. Internals will give their presentations during Practical5**

On successful completion you will be able to:

- Effectively communicate biology using written and oral media
- Locate and critically assess scientific literature

## Midsemester test

Due: **Intrl: Apr11th, Extrl: Apr15th**

Weighting: **15%**

The mid-semester test will consist of multiple choice and short answer questions cover all Lecture material up to and including Lecture 10. The test will be conducted under exam conditions, that is, silently and with no communication between students. No written material, programmable calculators, mobile phones or electronic tablets may be brought into the exam room.

On successful completion you will be able to:

- Define the processes of evolution
- Describe the major morphological characteristics of the main groups of organisms and compare and contrast their biology

## Scientific journal article

Due: **Intrl: May 16, Extrl: May 23**

Weighting: **22%**

This challenging task is designed to develop your scientific writing style, and your numerical and graphing skills. During Practicals 2-4 you will collect data to statistically analyse and graphically present in this article. To write your scientific article you will have to locate, comprehend, discuss and cite scientific literature (and *only* scientific literature). You also have to submit your *Scientific Journal Article* to turnitin (instructions below). By the time this article is due you should be familiar with how to write each of the sections of a research paper, be apply to source original peer-reviewed articles and be familiar with adhering to formatting criteria for any given journal. For the purposes of this exercise you will be asked to submit to an in-house journal only available to Biol114 subscribers known as the Journal of Seedy Research.

On successful completion you will be able to:

- Develop falsifiable hypotheses and design experiments to test them
- Test a hypothesis by collecting and analysing appropriate data
- Use digital microscopy technology to successfully visualise specimen

## Final exam

Due: **TBA**

Weighting: **50%**

A test on knowledge of lecture and practical material up to and including week 13

On successful completion you will be able to:

- Define the processes of evolution
- Describe the major morphological characteristics of the main groups of organisms and compare and contrast their biology
- Develop falsifiable hypotheses and design experiments to test them
- Test a hypothesis by collecting and analysing appropriate data
- Locate and critically assess scientific literature

## **Delivery and Resources**

### **TECHNOLOGY USED AND REQUIRED**

#### **Website**

Lecture graphics and iLectures will be available on iLearn <http://ilearn.mq.edu.au>

iLearn™ is a web-based computer mediated communication package and can be accessed by most web browsers from inside or outside the University. iLearn and email will be the principle method of communication in this subject. We expect you to use iLearn for:

- Doing the weekly quizzes;
- Regularly checking subject announcements;
- Discussing lectures and tutorials with lecturers and other students;
- Downloading lecture materials;
- Downloading reference materials;

How do you log in? The URL for the iLearn login page is: <http://ilearn.mq.edu.au/>. You will need to log in to iLearn each time you use it. Your user name is your student number.

If you are having trouble accessing your online unit due to a disability or health condition, please go to the Student Services Website at [http://students.mq.edu.au/campus\\_life/wellbeing/](http://students.mq.edu.au/campus_life/wellbeing/) for information on how to get assistance.

If you are having problems logging on after ensuring you have entered your username and password correctly, you should contact Student IT Help, <http://informatics.mq.edu.au/help/>.

### **LECTURE AND PRACTICAL TIMES**

#### **LECTURES**

Lecture 1 Macquarie Theatre	Thursday	11 – 12	W2.4A
Lecture 2 Macquarie Theatre	Friday	3 – 4	W2.4A

**All internal students are expected to attend both the Lectures each week! All externals**

**must listen to both Lectures each week and attend if and when they can!**

## INTERNAL PRAC SESSIONS

Monday	12 – 3	E8A 120 & E8A 160
Monday	3 – 6	E8A 120 & E8A 160
Tuesday	9 – 12	E8A 120 & E8A 160
Tuesday	2– 5	E8A 120 & E8A 160
Wednesday	9 - 12	E8A 120 & E8A 160
Wednesday	12 –3	E8A 120 & E8A 160
Wednesday	3 - 6	E8A 120 & E8A 160

**Internal students must attend ONLY ONE of the above Practical sessions per week.** You must attend the practical group you were allocated at enrolment, and stay in that group! If there is unexpected enrolment numbers we will offer an additional Monday afternoon practical session. Attendance of practicals is compulsory!

## EXTERNAL PRAC SESSIONS

On-campus session 1	15 March (Sat)	9am - 4pm	E8A 120
On-campus session 2	14 - 15 April (Mon & Tues)	9am - 4pm	E8A 120
On-campus session 3	24 - 25 May (Sat & Sun)	9am - 4pm	E8A 120

**External students must attend ALL on-campus sessions!**

## REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

### Recommended unit materials

#### *Textbook*

The textbook for this unit is Principles in Biology by Nature Publishing - We are trialling a new e-textbook. Details for accessing and purchasing this text will be available via ilearn in the first week.

## CHANGES SINCE THE LAST OFFERING OF THE UNIT

The unit has created a new skills test component which is meant to test the students proficiency at certain core research skills. Four practicals have been substantially modified to place a greater emphasis on selection, adaptation and their role in generation of diversity. A group assignment has been re-instated and the class experiment has been broadened in its scope in an attempt to give students a greater appreciation of the role of competition.

## Unit Schedule

### LECTURE SCHEDULE

DATE	LECTURER	TOPIC
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- |     |              |         |  |
|-----|--------------|---------|--|
| 1.  | 06 / 03 / 14 | Matthew | Introduction to BIOL114                        |
| 2.  | 07 / 03 / 14 | Matthew | The scientific process – how is it done?       |
| 3.  | 13 / 03 / 14 | Matthew | What is life and where did it come from?       |
| 4.  | 14 / 03 / 14 | Matthew | Evolution: What is it?                         |
| 5.  | 20 / 03 / 14 | Matthew | Evidence for evolution and natural selection   |
| 6.  | 21 / 03 / 14 | Matthew | Basic genetic principles and genetic variation |
| 7.  | 27 / 03 / 14 | Matthew | Evolutionary change and how it is described    |
| 8.  | 28 / 03 / 14 | Matthew | The concept of species and speciation          |
| 9.  | 03 / 04 / 14 | Matthew | Cellular organisation and single-cell life     |
| 10. | 04 / 04 / 14 | Matthew | Eukaryotes and multicellular life              |
| 11. | 10 / 04 / 14 | Matthew | The “Left wall” of life                        |
| 12. | 11 / 04 / 14 | Matthew | Plants as living multi-cellular organisms      |

12 / 04 / 14 – 27 / 04 / 14		MIDSEMESTER BREAK
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- |     |              |                |  |
|-----|--------------|----------------|--|
| 13. | 01 / 05 / 14 | Matthew        | Mid-semester Test                            |
| 14. | 02 / 05 / 14 | TBA            | Curious plant biology                        |
| 15. | 08 / 05 / 14 | Matthew        | Animals as living multicellular organisms    |
| 16. | 09 / 05 / 14 | Matthew        | Energy and growth in multicellular organisms |
| 17. | 15 / 05 / 14 | Matthew        | Reproduction of multicellular organisms      |
| 18. | 16 / 05 / 14 | Matthew        | Life-history stages of plants and animals    |
| 19. | 22 / 05 / 14 | Matthew        | Behaviour of plants and animals              |
| 20. | 23 / 05 / 14 | Matthew        | Ecology and the environment                  |
| 21. | 29 / 05 / 14 | James Woodford | Milthorpe Lecture                            |
| 22. | 30 / 05 / 14 | Matthew        | Population ecology                           |
| 23. | 05 / 06 / 14 | Matthew        | Community ecology                            |
| 24. | 06 / 06 / 14 | Matthew        | Ecosystems and the future of planet Earth    |

### PRACTICAL TOPICS

#### Internals

Prac	Date	Activity	Assessment Dates
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Pre-labs	NO LABS FIRST WEEK	Answer pre-prac questions in preparation for Prac 1	<b>Weekly online activities</b>  Opens: 03/03/14 12 pm  Closes: 10/03/14 12 pm  *NB no quiz this week only task.
1	10 - 12/03/14	<i>Introduction to practicals</i> Safety induction Library challenges Induction to digital microscopy	<b>Weekly online activities</b>  Opens: 10/03/14 12 pm  Closes: 17/03/14 12 pm
2	17 – 22/03/14	<i>Scientific method</i>  Applying the scientific method  BIOL114 exp and set-up  Writing materials and methods	<b>Weekly online activities</b>  Opens: 17/03/14 12 pm  Closes: 24/03/14 12 pm  <a href="#">Skill test 1: Article search</a>
3	24 – 26/03/14	<i>Early life on earth</i> Stromatolites Cyanobacteria Phylogenies - display evolution BIOL114 exp data collection	<b>Weekly online activities</b>  Opens: 24/03/14 12 pm  Closes: 31/03/14 12 pm  <a href="#">Skill test 2: Microscope set-up</a>
4	31/03 - 02/04/14	<i>Natural selection</i> How does selection work? Consequences of selection BIOL114 exp data collection	<b>Weekly online activities</b>  Opens: 31/03/14 12 pm  Closes: 07/04/14 12 pm

5	07 - 09/04/14	<p><i>Cells, cells, and more cells</i></p> <p>Bacteria, Protozoa, Plant and Animal</p> <p>BIOL114 exp data collection</p>	<p><b>Weekly online activities</b></p> <p>Opens: 07/04/14 12 pm</p> <p>Closes: 14/04/14 12 pm</p> <p><b>Mini-oral presentation</b></p> <p><b>Mid-semester Test:</b> lecture 11/04</p>
Mid-semester break 12/04 to 27/04			
6	28/04 – 30/04/14	<p><i>Scientific Research Report</i></p> <p>Data collation and analysis</p> <p>Plagiarism</p> <p><b>Prac-report due:</b></p> <p><b>Internals: May 16<sup>th</sup> @ 5 pm.</b></p> <p><b>Externals: May 23<sup>rd</sup> @ 5 pm</b></p>	<p><b>Weekly online activities</b></p> <p>Opens: 28/04/14 12 pm</p> <p>Closes: 05/05/14 12 pm</p> <p><a href="#">Skill test 3: Writing a paper</a></p>
7	05 – 07/05/14	<p><i>Organisms and their environment I</i></p> <p>Reproductive success</p> <p>Offspring survival</p> <p>Evolutionary trade-offs</p>	<p><b>Weekly online activities</b></p> <p>Opens: 05/05/14 12 pm</p> <p>Closes: 12/05/14 12 pm</p> <p><a href="#">Skill test 4: Plotting data in EXCEL</a></p>
8	12 – 14/05/14	<p><i>Organisms and their environment II</i></p> <p>Offspring survival</p> <p>Evolutionary trade-offs</p> <p>Diversity</p>	<p><b>Weekly online activities</b></p> <p>Opens: 12/05/14 12 pm</p> <p>Closes: 19/05/14 12 pm</p> <p><b>Prac report due this week for:</b></p> <p><b>Internals: May 16<sup>th</sup> @ 5 pm.</b></p>

9	19 – 21/05/14	<i>Organisms and their environment III</i> The Arborgaine	<b>Weekly online activities</b>  Opens: 19/05/14 12 pm  Closes: 26/05/14 12 pm  <b>Prac report due this week:</b>  <b>Externals: May 23<sup>rd</sup> @ 5 pm</b>  <b>Skill test 5:</b> <a href="#">Interpreting phylogenies</a>
10	26 – 28/05/14	Meet & greet researchers in department; Tutors return prac-report to students  BIOL114 Synthesis & discussion of final exam	<b>Weekly online activities</b>  Opens: 26/05/14 12 pm  Closes: 02/05/14 12 pm

## Externals

External Schedule	Dates	Practicals	Assessment
On Campus Session 1	15 March (Sat)	Pracs 1, 2	Do weekly quizzes with internals as they become available  <a href="#">Skill test 1: Article search – Prac2</a>
On Campus Session 2	14-15 April (Mon & Tues)	Pracs 3, 4, 6, 7	Do weekly quizzes with internals as they become available <a href="#">Skill test 2: Microscope set-up – Prac3</a>  <b>Mid Semester Test April 15<sup>th</sup> @ 9 am</b>  <a href="#">Skill test 3: Writing a paper – Prac6</a>  <a href="#">Skill test 4: Plotting data in EXCEL – Prac7</a>
On Campus Session 3	24 – 25 May (Sat & Sun)	Pracs 5, 8, 9, 10	Do weekly quizzes with internals as they become available  <b>Mini-oral presentation – Prac5</b>  <a href="#">Skill test 5: Interpreting phylogenies – Prac9</a>  <b>Prac report due May 23<sup>rd</sup> @ 11 am</b>

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy [http://mq.edu.au/policy/docs/grievance\\_management/policy.html](http://mq.edu.au/policy/docs/grievance_management/policy.html)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html) *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

#### Learning outcomes

- Test a hypothesis by collecting and analysing appropriate data
- Effectively communicate biology using written and oral media
- Locate and critically assess scientific literature
- Use digital microscopy technology to successfully visualise specimen

### Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

#### Learning outcomes

- Describe the major morphological characteristics of the main groups of organisms and compare and contrast their biology
- Develop falsifiable hypotheses and design experiments to test them
- Locate and critically assess scientific literature

### Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

## **Learning outcomes**

- Define the processes of evolution
- Describe the major morphological characteristics of the main groups of organisms and compare and contrast their biology
- Develop falsifiable hypotheses and design experiments to test them
- Test a hypothesis by collecting and analysing appropriate data
- Use digital microscopy technology to successfully visualise specimen

## **Critical, Analytical and Integrative Thinking**

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

## **Learning outcomes**

- Define the processes of evolution
- Develop falsifiable hypotheses and design experiments to test them
- Test a hypothesis by collecting and analysing appropriate data
- Locate and critically assess scientific literature

## **Problem Solving and Research Capability**

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

## **Learning outcomes**

- Define the processes of evolution
- Describe the major morphological characteristics of the main groups of organisms and compare and contrast their biology
- Develop falsifiable hypotheses and design experiments to test them
- Test a hypothesis by collecting and analysing appropriate data
- Locate and critically assess scientific literature

## Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

### Learning outcomes

- Develop falsifiable hypotheses and design experiments to test them
- Test a hypothesis by collecting and analysing appropriate data
- Effectively communicate biology using written and oral media
- Locate and critically assess scientific literature

## Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

### Learning outcome

- Effectively communicate biology using written and oral media

## Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

### Learning outcomes

- Define the processes of evolution
- Effectively communicate biology using written and oral media
- Locate and critically assess scientific literature

## Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and

country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

## **Learning outcomes**

- Define the processes of evolution
- Develop falsifiable hypotheses and design experiments to test them
- Effectively communicate biology using written and oral media
- Locate and critically assess scientific literature