BIOL210

Plant Structure and Function

S1 Day 2014

Dept of Biological Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
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Credit points
3

Prerequisites
(12cp(P) including 6cp(P) in BIOL units at 100 level) or admission to GCertBiotech

Corequisites

Co-badged status

Unit description
Plants are spectacularly diverse because of the unrelenting interaction of genes and environment. This produces variations on basic structures (such as leaf morphology) and functions (such as water loss through stomata) that adapt plants to their surroundings. This unit reveals how structure and function underpin the performance of wild and cultivated plants at many levels of organisation, from entire communities (such as rainforests) through to the expression of individual genes. Mechanisms of adaptation to a range of adverse conditions typically found in Australia are addressed. The discovery of principles is achieved through a broad range of laboratory experiments and discussion. This unit leads to the specialist third year unit in plant biology, BIOL313.

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:

Identify morphological features of plants and describe how major taxa such as the

grasses and legumes differ from each other.
Explain how the individual organs are assembled to make complex organisms such as land plants and aquatic plants. Higher plants will be the focus of the unit although reference to ferns and algae will be made at times.
Link and name the basic morphological structures and the anatomy of those structures.
Describe the basic steps in the higher plant life cycle and the key steps in reproductive biology. You will also need to be familiar with the major biotic interactions between host plants and their symbionts.
Describe the essential characteristics of the World's major ecosystems.
Demonstrate a clear understanding of the major material cycles of plants, including photosynthesis, dark respiration and the carbon and nitrogen cycles.
Understand the distinction between growth and development and how they are regulated by hormones.
Identify the major plant-environment interactions in Australia's landscape, the acclimation to abiotic stresses and the most important adaptive changes that underpin plant life in this harsh environment.

Assessment Tasks

Name	Weighting	Due
10 Quizzes	30%	Weeks 2 - 11
Mid-semester test	10%	Week 7
Final examination	50%	Exam Period
Pre-prac quizzes	10%	Weekly from Week 2

10 Quizzes

Due: **Weeks 2 - 11**
Weighting: **30%**

Each quiz comprises either a sheet of three questions or several electronic multiple choice questions. You complete one quiz each week by going to the iLearn site.

Weight 10 x 3% = 30%

On successful completion you will be able to:

- Identify morphological features of plants and describe how major taxa such as the grasses and legumes differ from each other.

- Explain how the individual organs are assembled to make complex organisms such as land plants and aquatic plants. Higher plants will be the focus of the unit although reference to ferns and algae will be made at times.
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Mid-semester test

Due: **Week 7**
Weighting: **10%**

Students will sit a mid-session revision test during lecture (week 7) for internals. This will be more than a straight forward revision of the material covered in the first group of lectures and associated practicals, covering morphology and anatomy.

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- Link and name the basic morphological structures and the anatomy of those structures.
- Describe the basic steps in the higher plant life cycle and the key steps in reproductive biology. You will also need to be familiar with the major biotic interactions between host plants and their symbionts.

Final examination

Due: **Exam Period**
Weighting: **50%**

The final examination will count for 50% of the final mark. It will consist of a series of:

1. forty multiple choice questions;
2. twelve short answer questions which are presented verbatim from those appearing at the end of each lecture and
3. a single essay.

On successful completion you will be able to:

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Pre-prac quizzes

Due: **Weekly from Week 2**
Weighting: **10%**

This will be a very brief quiz, taking just one minute, to be held prior to each practical session (except Week 1). It will entail about five questions to be answered in multiple choice form on an elecronic answering sheet. The questions will ask you to confirm very simply (non-interpretative) facts about the prac. session you are about to commence. The goal is to ensure that you have the prac. notes before you arrive. Each quiz will contribute one mark to your final grade.

On successful completion you will be able to:

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- Explain how the individual organs are assembled to make complex organisms such as land plants and aquatic plants. Higher plants will be the focus of the unit although reference to ferns and algae will be made at times.

Delivery and Resources

CLASSES

Lectures

Please Note

- Lectures are held Mondays, 10am to 11am then a second lecture from 11am to noon, in E7B T5 Theatre. You are strongly encouraged to attend live lectures in order to avoid falling behind.
- Lecture powerpoint slide pdfs will be available on the website before lecture.
- Lecture recordings will be available under the iLecture/Echo360 icon on the website soon after the lecture.

Tutorials

We do not offer tutorials in their own time slot but endeavour to use the practical slots for a vigorous exchange of ideas and participation from everyone. Science is rarely a matter of hard truths and everyone should feel relaxed about contributing to these question and answer sessions. This is a chance to find out where yourteachers have failed to explain what they mean and for you do delve into the realms of the unknown in plant biology. Some teaching might be done by a class tutor.

A Forum is also on the iLearn site and you should use it to communicate with lecturing staff in an efficient way. Writing your ideas down really helps.

Practicals

Internal labs are held in the Glasshouse Labs at the top of the F5A carparks. From the back of E8C look to your right across the main campus walkway. The multi-level parking structure you see is the F5A carparks. Go across the main campus walkway, continue on along the back wall of the CSIRO building (E6A) and you'll see a set of stairs next to a lift shaft. Go to the top of the stairs and turn left and go through the gate. The building to your right is the Glasshouse labs. The front of the building is the potting up area, the main lab is located at the back of the far end of the building.

You need to bring a lab notebook with you to the labs. The first few weeks involve considerable microscopy and as such you will be required to make notes and drawings of what you observe. Bring pencils and pens. A calculator would also be an advantage. Your textbook will be referred to during lab classes so having it on hand will help. **Closed toed shoes (preferably not with slip in slip out heals) are mandatory**.

Practical sessions will start on time and tardiness is unhelpful and distracting. Attendance is mandatory and a roll will be taken. **There will also be an assessible pre-prac. quiz to test your knowledge of the prac notes for that week**. Students must attend their assigned practical session unless prior arrangements are made with the Unit Convenor or you risk missing that

week's prac. session. Mobile phones must be turned off and the following safety procedures must be followed at all times. There are three prac slots:

- 10 am - 1 pm Tuesdays
- 2 pm – 5 pm Tuesdays
- 10 am – 1 pm Wednesdays

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

Reference material

There are many good texts in plant physiology. Few are totally comprehensive, it's more a matter of finding which one suits your purposes. The recommended text for the unit, Biology of Plants by Raven et al. will be available from the bookstore and in the University Library's Reserve Section. The text Plants in Action will also be held in Reserve.

Core texts:

- Raven P. H., Evert R. F. & Eichhorn S. E. 2005. *Biology of Plants*. 7th Ed. W.H. Freeman and Company
- Atwell, B.J., Kriedemann, P.E. & Turnbull, C.G.N. 1999. *Plants in Action*. Macmillan Education Australia

There are many other plant textbooks that you might look at for other views on subjects of interest.

Journal articles:

We do not ask that you spend a lot of time reading primary literature. However, be aware of the key plant journals you might use some day as researchers: *Plant Physiology, Australian Journal of Botany, Functional Plant Biology, Planta, Plant Cell and Environment, Oecologia* and *Physiologia Plantarum.* The University Library has these journals online and you have access to them. **Biological Abstracts: Biosis Previews** is a brilliant search tool that gives you good access to all articles, authors, etc. across all journals. Please learn how to these databases by logging in with your username and password.

UNIT WEBPAGE AND TECHNOLOGY USED AND REQUIRED

The unit website is located at - https://ilearn.mq.edu.au/

Username and Password have been supplied to you for all online materials.

N.B. – this material is repeated partially in the unit overview and on the unit website.

Unit Schedule

WEEK	LECTURE TOPIC	DESCRIPTION OF LECTURE	DESCRIPTION OF PRACTICAL

1	**I. Plants at all Levels** 1. Why plants? (BA) 2. Plant cells (BA) 27th Feb)	1. General characteristics of plants, their evolution and their significance. 2. Examples of cell types and their function. Vascular systems.	Introduction to pracs in BIOL210; safety talk; microscopy, relevant texts and references; assessment tasks. Plant morphology – functional units of above ground (shoots etc) and below ground (roots) organs
2	3. Leaves and Stems (BA) 4. Sexual and asexual organs (BA)	3. Structure and function. Primary growth and secondary thickening. 4. Structure, autonomy and physiology of ripening.	The structure of higher plants; assembling whole plants from component organs; annual vs perennial habit; measuring source-sink relationships; introducing microscopy.
3	5. Seeds (BA) 6. Roots (BA)	5. Diversity and structure. Ploidy, dormancy and physiology. 6. Structure and function. Primary growth and secondary thickening.	The structure of flowers, basics of identifying native plants. The herbarium as a repository of information.
4	7.Natural plant communities (ML) 8. Managed plant communities (BA)	7. Ecology of Australasian communities, arid to riparian. 8. Crops and food production in Australia - crop adaptation and origins Resource, allocation in whole plants.	An atomy and histology of various plant tissues. Embryo/ endospermdistinction in seeds. Sap transport in fleshy and woody tissues.
5	**II. Plant Processes** 9.Mycorrhizas (ML) 10. Nitrogen fixation (BA)	9. Diversity, symbiotic function and genetics. 10. Nodulated species: their ecology, genetics and function.	Nodules of different origins. Nitrogen status of seeds.
6	11.Photosynthesis (BA) 12. Photosynthesis (BA)	11. Evolution of photosynthetic organisms. 12. Light reactions of photosynthesis.	Chromatography of algal and higher plant pigments; pigments and senescence; light harvesting and the Hill reaction.
7	13.Photosynthesis (BA) 14. **Mid-semester Test**	13. C3, C4 and CAM photosynthesis: structure and metabolism.	Photosynthetic leaf anatomy.
8	15.Respiration (BA) 16. Nutrient and water acquisition (BA)	15.Losing carbon and generating new skeletons and energy. 16. Concentrating nutrients to achieve water flow and growth.	Response to phosphate supply; respiration measured in microalgae.

9	**III. Constructing a Living Plant** 17.Primary and secondary growth (BA) 18. Development (BA)	17.Meristems, growth analysis. Annuals and perennials including trees. 18. Development phytomers, phyllochron, plasticity.	Growth rates in a range of adverse environments. Plant development and its control by environment and genetics.
10	19.Hormones (BA) 20.Flooding (BA)	19. Coordinating and optimising function. 20. Surviving water excess and oxygen shortfall - structures and processes.	Effect of auxin on seed germination; aerenchyma using light microscopy; leaf growth in grasses.
11	**IV. Plants Coping with their Environment** 21. Drought (BA) 22. Salinity (BA)	21.Surviving water deficits - structures and processes. 22.Ions exacerbating water deficits and inducing toxicities.	Osmotic vs hydraulic drought; salt tolerant species and interaction with waterlogging; leaf growth under stress conditions.
12	23. Light (BA)	23. Problems surviving too much or too little light - deserts and jungles.	Revision.
13	24.Climate Change (BM)	24. Mechanisms of response to climate change - predictions.	
14	25. Stories of plant research (all BIOL 210 lecturers)	25. Brief encounters with the research from our own laboratories and field sites – potential careers in plant biology?	

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

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

Disruption to Studies Policy 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/

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) 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

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

- Explain how the individual organs are assembled to make complex organisms such as land plants and aquatic plants. Higher plants will be the focus of the unit although reference to ferns and algae will be made at times.
- Describe the basic steps in the higher plant life cycle and the key steps in reproductive biology. You will also need to be familiar with the major biotic interactions between host plants and their symbionts.
- Identify the major plant-environment interactions in Australia's landscape, the acclimation to abiotic stresses and the most important adaptive changes that underpin plant life in this harsh environment.

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

- Identify morphological features of plants and describe how major taxa such as the grasses and legumes differ from each other.
- Link and name the basic morphological structures and the anatomy of those structures.
- Demonstrate a clear understanding of the major material cycles of plants, including photosynthesis, dark respiration and the carbon and nitrogen cycles.
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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

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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

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by hormones.
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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

- Identify morphological features of plants and describe how major taxa such as the grasses and legumes differ from each other.
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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

- Identify morphological features of plants and describe how major taxa such as the grasses and legumes differ from each other.
- Describe the essential characteristics of the World's major ecosystems.

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 outcomes

- Explain how the individual organs are assembled to make complex organisms such as land plants and aquatic plants. Higher plants will be the focus of the unit although reference to ferns and algae will be made at times.
- Link and name the basic morphological structures and the anatomy of those structures.
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- Describe the essential characteristics of the World's major ecosystems.

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

- Describe the basic steps in the higher plant life cycle and the key steps in reproductive biology. You will also need to be familiar with the major biotic interactions between host plants and their symbionts.
- Describe the essential characteristics of the World's major ecosystems.

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

- Describe the basic steps in the higher plant life cycle and the key steps in reproductive biology. You will also need to be familiar with the major biotic interactions between host plants and their symbionts.
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- Identify the major plant-environment interactions in Australia's landscape, the acclimation to abiotic stresses and the most important adaptive changes that underpin plant life in this harsh environment.

Changes since First Published

Date	Description
15/01/2014	The Prerequisites was updated.