



CBMS792

Research Topic: Chemical Biology

S2 Evening 2015

Dept of Chemistry & Biomolecular Sciences

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General Information

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Credit points

4

Prerequisites

Admission to MRes

Corequisites

Co-badged status

Unit description

This unit comprises study of an advanced topic in chemistry and biomolecular sciences. The area studied each year is tailored to the current student cohort. Emphasis is put on both the understanding of advanced concepts as well as their application in problem-solving and/or research environments. Chemical biology is the science of small molecules in the context of living systems. This course focuses on current topics in chemical biology, particularly experiments in which small molecules are used to probe or control biological systems in novel ways or manipulate biological systems. As the goal of the course is to familiarise students with innovative recent experimental approaches and to stimulate them to explore the boundaries of chemistry and biology, the unit will be taught extensively through the primary literature.

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:

be able to compare and contrast chemical genomics and proteomics methods

- Be able to compare and contrast the main chemical tools used in cell biology with reference to their chemical and physical basis
- Be able to write out the mechanism of action of major classes of small molecules in modulating protein pathways
- Be able to apply chemical rationale for the design, synthesis, and application of small molecules for the manipulation of biological systems
- Be able to understand the scientific language and concepts in the primary literature relevant to chemical biology.
- Be able to write out the mechanism for reactions in primary and secondary metabolism

Assessment Tasks

Name	Weighting	Due
FInal Exam	50%	Week 15
assignments	40%	various
oral presentation	10%	week 9 and 13

FInal Exam

Due: **Week 15**

Weighting: **50%**

3 hr plus 10 minutes reading time

On successful completion you will be able to:

- be able to compare and contrast chemical genomics and proteomics methods
- • Be able to compare and contrast the main chemical tools used in cell biology with reference to their chemical and physical basis
- • Be able to write out the mechanism of action of major classes of small molecules in modulating protein pathways
- • Be able to write out the mechanism for reactions in primary and secondary metabolism

assignments

Due: **various**

Weighting: **40%**

8 written assignments worth 5% each

On successful completion you will be able to:

- be able to compare and contrast chemical genomics and proteomics methods
- • Be able to compare and contrast the main chemical tools used in cell biology with reference to their chemical and physical basis
- • Be able to write out the mechanism of action of major classes of small molecules in modulating protein pathways
- • Be able to understand the scientific language and concepts in the primary literature relevant to chemical biology.
- • Be able to write out the mechanism for reactions in primary and secondary metabolism

oral presentation

Due: **week 9 and 13**

Weighting: **10%**

two oral presentations worth 5% each

On successful completion you will be able to:

- be able to compare and contrast chemical genomics and proteomics methods
- • Be able to compare and contrast the main chemical tools used in cell biology with reference to their chemical and physical basis
- • Be able to apply chemical rationale for the design, synthesis, and application of small molecules for the manipulation of biological systems

- Be able to understand the scientific language and concepts in the primary literature relevant to chemical biology.

Delivery and Resources

lectures

tutorials

iLearn

Unit Schedule

Lecture 5-7PM Mondays from week 1-13 in F7B325 (ignore the university timetable)

Wk 1-4 Dr Andrew Piggott (Natural Product Target Identification)

While Nature continues to deliver a myriad of potent and structurally diverse bioactive molecules, the cellular targets and modes of action of these fascinating molecules are seldom known, making it challenging to design and develop pharmaceutical agents based on natural products. This section will cover the application of forward and reverse chemical proteomics and *in vitro* display technologies to the identification of natural product cellular targets.

Wk 1: Forward Chemical Proteomics

Wk 2: Reverse Chemical Proteomics (Assignment AP1 due)

Wk 3: In-vitro Display Technologies (Assignment AP2 due)

Wk 4: Student Presentations

Wk 5-8 Dr Fei Liu (Small Molecules in Chemical Biology)

Small molecules are frequently used as chemical tools for probing biological systems or engineering new bio-networks with new function. This section will cover current topics in the use of chemical tools in mammalian systems that have led to new approaches in drug discovery and elucidation of new cellular mechanisms.

Wk 5: Introduction to the uses of small molecules in chemical biology

Wk 6: Probing protein pathways with small molecules (Assignment FL1 due)

Wk 7: Targeted molecular therapeutics (Assignment FL2 due)

Wk 8: Student presentations

Wk 9-13 Professor Peter Karuso (Primary and Secondary Metabolism)

The first five-week section will introduce you to the **chemistry of biological systems**, from primary metabolism and energy production to secondary metabolism. We will dissect mechanisms behind how and why nature has chosen specific pathways to synthesise new

molecules and convert one molecule into another. The final section will cover aspects of biologically inspired total synthesis of natural products.

Wk 9: The Origin of Life, the Universe and well everything

Wk 10: Bizarre Chemistry of Primary Metabolism (Assignment PK1 due)

Wk 11: Alkaloids (Assignment PK2 due)

Wk 12: Polyketides (Assignment PK3 due)

Wk 13: Terpenoids (Assignment PK4 due)

Wk 14: Study Break

Wk 15: Examination week (CBMS792 has a final exam worth 50%)

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/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au.

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

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcome

- Be able to apply chemical rationale for the design, synthesis, and application of small molecules for the manipulation of biological systems

Assessment task

- oral presentation

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen

fields.

This graduate capability is supported by:

Learning outcomes

- be able to compare and contrast chemical genomics and proteomics methods
- • Be able to compare and contrast the main chemical tools used in cell biology with reference to their chemical and physical basis
- • Be able to write out the mechanism of action of major classes of small molecules in modulating protein pathways
- • Be able to write out the mechanism for reactions in primary and secondary metabolism

Assessment tasks

- Final Exam
- assignments
- oral presentation

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- be able to compare and contrast chemical genomics and proteomics methods
- • Be able to compare and contrast the main chemical tools used in cell biology with reference to their chemical and physical basis
- • Be able to apply chemical rationale for the design, synthesis, and application of small molecules for the manipulation of biological systems

Assessment tasks

- Final Exam
- assignments
- oral presentation

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or

practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- • Be able to write out the mechanism of action of major classes of small molecules in modulating protein pathways
- • Be able to apply chemical rationale for the design, synthesis, and application of small molecules for the manipulation of biological systems
- • Be able to understand the scientific language and concepts in the primary literature relevant to chemical biology.

Assessment tasks

- Final Exam
- assignments
- oral presentation

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- be able to compare and contrast chemical genomics and proteomics methods
- • Be able to compare and contrast the main chemical tools used in cell biology with reference to their chemical and physical basis
- • Be able to understand the scientific language and concepts in the primary literature relevant to chemical biology.

Assessment tasks

- Final Exam
- assignments
- oral presentation

Changes from Previous Offering

PK section is now last instead of first