



PHYS700

Research Frontiers in Physics and Astronomy 1

S1 Day 2015

Dept of Physics and Astronomy

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General Information

Unit convenor and teaching staff

Unit Convenor

David Coutts

david.coutts@mq.edu.au

Contact via david.coutts@mq.edu.au

E6B 2.714

Other Staff

Daniel Terno

daniel.terno@mq.edu.au

Contact via daniel.terno@mq.edu.au

e6b 2.715

Daniel Terno

daniel.terno@mq.edu.au

Credit points

4

Prerequisites

Admission to MRes

Corequisites

Co-badged status

Unit description

This unit will engage students with research frontiers in physics and astronomy. Students will attend research seminars and journal clubs within the department's four major research centres as well as follow a directed reading program of current literature. Students will be expected to actively critique and review selected literature through reports and group discussions.

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:

Students will have improved their skills in understanding difficult and unfamiliar research

material in written or spoken form.

Students will gain insight and understanding about the context for a range of frontier activities in several research fields of physics and astronomy.

Students will develop and apply skills in written and oral communication of recent research results and critical analysis of those results.

Students will develop a moderate capability in evaluating and describing how new results sit in the context of existing knowledge and ideas, and skills in assessing the likely impact of new research.

Students will develop and apply technical skills in accessing and navigating the scientific literature.

Assessment Tasks

Name	Weighting	Due
<u>Journal club presentations</u>	30%	Throughout session
<u>Journal club participation</u>	20%	Throughout session
<u>Seminar responses</u>	25%	Throughout session
<u>Opportunity essay</u>	25%	Outline: 2/4; Essay: 12/6

Journal club presentations

Due: **Throughout session**

Weighting: **30%**

A journal club is a good way for a research group to stay informed of recent results.

Each session, a recent paper is selected and announced in advance. Everyone is expected to read the paper thoroughly and try to make some sense of it. One member presents the paper with a series of slides that typically provide some background on the group(s) who wrote the paper and their interests, the major issues in the field, a summary of the actual results, and some thoughts on their significance. The paper should be put in context of previous and current work. Parts of the paper that were unclear (or that the presenter simply doesn't understand) can be identified and provide a good starting point for discussion.

In this unit, with help from one of the lecturers each student will select a paper from one of the top journals: Nature, Nature Photonics, Nature Communications, Nature Physics, Physical Review Letters, Science, The Astrophysical Journal etc. The paper should be chosen to be as accessible as possible given our limited experience and the broad range of fields we are looking at. The paper should be selected and circulated to the class at least one week before the presentation.

At a scheduled class meeting, the student will present the paper with a series of slides for around

20 minutes. We will have some practice/demo examples early in the session. As well as describing the actual work in the paper, students are expected to uncover some of the background of the field and the interests of the group. Students will be assessed on

- clarity and accuracy of the presentation
- degree to which they have investigated the background of the authors and their interests
- degree to which they have put the paper in context of previous and current research
- quality of arguments about the merits and potential impact of the work
- ideas for future directions

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- Students will develop and apply skills in written and oral communication of recent research results and critical analysis of those results.
- Students will develop a moderate capability in evaluating and describing how new results sit in the context of existing knowledge and ideas, and skills in assessing the likely impact of new research.
- Students will develop and apply technical skills in accessing and navigating the scientific literature.

Journal club participation

Due: **Throughout session**

Weighting: **20%**

Students are expected to have read the weekly journal club paper.

During and following the presentation, there will be a discussion of the ideas in the paper and any unclear concepts.

Marks will be awarded on a "micro-point" basis for all constructive contributions to the discussion, whether raising questions about elements that were unclear to the student, or more general comments about the paper, the group, or the field etc.

Participants should demonstrate that they have read and studied the paper prior to the Journal Club presentation.

Making two constructive comments per session for 8 sessions will be sufficient to obtain 75% of this component. Additional insightful comments or very active contribution will be awarded additional marks towards the remaining 25%.

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- Students will develop a moderate capability in evaluating and describing how new results sit in the context of existing knowledge and ideas, and skills in assessing the likely impact of new research.

Seminar responses

Due: **Throughout session**

Weighting: **25%**

Regular engagement with the research seminars and colloquia is a very important part of being an active and engaged researcher in any department, and is a vital part of PHYS700. Students will be expected to attend a minimum of 8 seminars/colloquia and respond to these on the online forum in iLearn.

As the session progresses, we will identify weekly seminars and colloquia that are most likely to be accessible to the group. We can expect that some talks will not be easy to understand and part of this assessment is about the skill of making whatever sense we can of unfamiliar concepts.

After each seminar, students will write 250 word responses to the seminars using an iLearn forum that will be made available. These responses may take a number of forms: a summary of the key ideas, some detailed comment on a particular area of the talk, an explanation of connections to related areas you may be familiar with.

Submitting these 250 word responses will then provide access to the discussion part of this forum. They will be able to read other student's responses, and then similar to the journal club, students will engage in a forum discussion of the ideas that come up using short posts. We can expect this to take place over a 2-5 days each week. Students should check in every now and then to participate.

75% of the marks for this task will be allocated to the 250 word responses based on insight, independent thinking. The remaining 25% will be awarded for the discussion component. An average of 2 insightful and reasonably independent contributions (only a few lines each time) per seminar will be sufficient for full marks.

Posts that depart from professional and constructive debate will attract negative marks.

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- Students will develop a moderate capability in evaluating and describing how new results sit in the context of existing knowledge and ideas, and skills in assessing the likely impact of new research.
- Students will develop and apply technical skills in accessing and navigating the scientific literature.

Opportunity essay

Due: **Outline: 2/4; Essay: 12/6**

Weighting: **25%**

Students will prepare a 1500 word essay on the *research opportunity* relating to a recent research breakthrough of their choice.

All research is set in the context of what has been done before, and what may follow. Breakthrough papers often claim to open up many new avenues for research, and to present a major step over what has already been achieved. In this essay students will critically evaluate the broader context of a recent research breakthrough (such as may be published as a paper in a high profile journal like Science or Nature), including how the research reported fits into the global picture that includes for example competing research programs tackling the same problem. Students will also critically evaluate opportunities for further research based on the breakthrough claimed in their chosen paper. An outstanding essay will not only provide both a critique of the opportunities claimed by the authors themselves, but also consider other possibilities offered by the reported breakthrough.

Essay topics must be discussed with the unit lecturers and a 1/2 page outline must be submitted before the mid session break.

On successful completion you will be able to:

- Students will gain insight and understanding about the context for a range of frontier activities in several research fields of physics and astronomy.

Delivery and Resources

Background

This unit focuses on accessing and understanding research results through seminars, colloquia

and papers.

It addresses questions like

- How do we make a start on understanding unfamiliar material?
- How do we present material describing other's results?
- How do we lead and contribute to a discussion of a third party's research work?

The key idea is that as scientists approaching new topics, the quantity and technical difficulty of material can be overwhelming. Nevertheless there are techniques that can allow us to grab footholds and start to develop a basic understanding of the material. In this unit, we will do this many times by encountering new research in several forms (papers, talks etc); following it up online by looking for further literature and other information; and reporting our conclusions in different ways: "journal club", workshop discussion, short blogs and discussion fora.

Amongst other things we will try to evaluate:

- novelty and potential impact
- wider context of the work
- probable correctness
- quality of presentation

We will also think about the ways scientific research is a *human* activity. This has implications for how scientists and teams of scientists plan their projects over a series of papers, and what are appropriate ways for us as consumers of scientific reporting to discuss and critique the work of others. We will also discuss factors around the process of publication, including the peer review process, research funding and careers which are all linked to the overall enterprise of research as captured through the Academic Literature.

The intention of this unit is that it should be unfamiliar and demanding, but rewarding. The skills developed and assessed are entirely different from any other unit this year. If you put in the time, it should be very achievable to perform well.

This is also a unit where discussion and (respectful) exchange of opinions is central. The more each of us puts in, the more fun we will have.

Class timetable

Main tutorial/workshop

The current schedule is for a 2-hour workshop, with the main activity to be journal clubs and discussion of those.

One or two students will present a journal club of around 20-25 minutes at each session which we will then discuss.

Other stuff related to seminars we've seen may come up from time to time.

Technologies used and resources

Part of the unit will involve online searching and accessing of current literature.

Changes in delivery

The unit has new staff this year. No other significant changes.

Unit Schedule

Structure

The first few weeks of this unit will introduce the skills we will be working on throughout the semester. These include how to begin to make sense of new journal articles and seminars, how to access literature using online resources, and how to present or discuss other groups' research work in verbal or written form. Following this initial period, we will have a series of weeks in which one or two people present their journal clubs and everyone engages in online and class discussion in relation to the papers or seminars recently encountered.

The approximate timing for these activities is as follows:

Week 1:

- Opening session and explanation of unit
- Presentations by two research centre directors
- How not to give a seminar

Week 2:

- First seminar attendance
- Navigating literature
- Example journal club
- Presentations by research centre directors

Week 3:

- Post-seminar discussion and analysis. Bring self-located paper germane to topic of seminar.
- Example journal club
- Presentations by research centre directors

Weeks 4-12:

- All students present two journal clubs (one short, and one longer) and participate in

discussions of other journal clubs

- All students regularly attend colloquia/seminars; summarise and discuss content in iLearn blog
- Other activities which may include: Library session (Library skills); Funding of research; The process of publishing (journal types, Vancouver protocol, publishing ethics. etc.); Establishing a research profile.

Essay - throughout the session:

Week 4 Discuss topic with unit lecturers.

Week 6 Half page outline due

End Week 13, Full essay is due.

Throughout the session you will be working on an essay on a research topic of your choice. The aim is to research the background of a topic of your choice, or relating to a recent published paper claiming an important breakthrough in research. The focus will be on the research context, and the opportunities that could arise as a result of the published work and other research currently being undertaken in the field. The aim is to gain experience of setting a research opportunity in context of the global research enterprise.

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](#).

Submission Deadlines

All deadlines are strict - extensions will only be granted by agreement with the Unit Convenor prior to the deadlines.

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.