ASTR178

Other Worlds: Planets and Planetary Systems

S2 External 2019

Dept of Physics and Astronomy

Contents

General Information

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Credit points
3

Prerequisites

Corequisites

Co-badged status

Unit description
This unit explores our solar system and the newly found planetary systems around other suns. We begin by examining the processes that have shaped the marvellous variety of worlds within our own solar system, from the scorched and buckled surface of Mercury, to the geysers of frozen methane on Neptune's largest moon, Triton. From this we build an understanding of how our solar system formed and subsequently evolved to become the system that we inhabit today. We then turn our attention to the ongoing discovery of a startling variety of planets around other stars and the advanced observing techniques employed. These provide a new and challenging perspective on our place in the Universe that is modifying the scientific theories of how generic planetary systems are formed. The unit highlights breaking news as the unit proceeds. As part of this unit there is the opportunity to observe the planets with the telescopes of the Macquarie University Observatory.

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:

Explain how using the scientific method allows science advances though observation.

Describe the content of our Solar System and how we have learned about it over time.

Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.

Identify the physical processes that are in action on Earth and in our Solar System.

Explain how we think our Solar System was born.

Summarise what we know of planets around stars other than the Sun.

Explain how extra-solar planets give us a new view of our own Solar System.

General Assessment Information

Unless otherwise advised, all assessment tasks are to be submitted via iLearn **before 11pm** on the appropriate due date. 10% of the assignment grade will be deducted for each late day. Assignments cannot be more than 5 days late. After 5 days the assignment will not be marked.

For all queries please e-mail ASTR178@mq.edu.au

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignments	20%	No	30 August 2019, 25 October 2019
Moon Practical	20%	No	4 October 2019
Short answer assessment	10%	No	11 October 2019
Final Examination	50%	No	University Examination Period

Assignments

Due: **30 August 2019, 25 October 2019**
Weighting: **20%**

There will be 2 multiple-choice assignments based on lecture material, worth a total of 20%. They are to be completed on-line, within iLearn, by the following due dates:

Assignment 1: Friday, 30 August 2019.

Assignment 2: Friday, 25 October 2019.

On successful completion you will be able to:

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
- Identify the physical processes that are in action on Earth and in our Solar System.
- Explain how we think our Solar System was born.
- Summarise what we know of planets around stars other than the Sun.
- Explain how extra-solar planets give us a new view of our own Solar System.

Moon Practical

Due: **4 October 2019**
Weighting: **20%**

The practical consists of two parts:

1. **A set of observations.** You will need to go outside in the early evening at least 7-10 times, and observe the position, phase, and orientation of the Moon. **Your observations must be conducted from 30 August to 14 September**, corresponding to the period between New Moon and Full Moon. If you miss the observational window of **30 August to 14 September** you will lose the marks associated with this exercise. Your observation chart and data are to be scanned or photographed and submitted to the iLearn system in jpeg or pdf format by **4 October.**
2. **An on-line quiz,** which is also to be completed within iLearn by **4 October.**

On successful completion you will be able to:

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.

Short answer assessment

Due: **11 October 2019**
Weighting: **10%**

This assignment will consist of questions that need to be answered in writing. This short-answer format is similar to what will also be used in the exam.

On successful completion you will be able to:

- Explain how using the scientific method allows science advances though observation.

- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
- Identify the physical processes that are in action on Earth and in our Solar System.

Final Examination

Due: **University Examination Period**
Weighting: **50%**

A two-hour final exam consisting of multiple-choice and short-answer questions will take place in the exam period of semester 2. No study materials will be allowed in the exam room.

External students must sit the final exam at one of the satellite locations on the same day and time as the final exam taken on campus. No exception can be made.

If you receive special consideration for the final exam, a **supplementary exam** will be scheduled after results are released. Please see FSE101 in iLearn for dates. **By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application.** Approved applicants will receive an individual notification **one week prior to the exam with the exact date and time** of their supplementary examination. Second chance exams for hurdle assessments will also be scheduled in this period.

On successful completion you will be able to:

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
- Identify the physical processes that are in action on Earth and in our Solar System.
- Explain how we think our Solar System was born.
- Summarise what we know of planets around stars other than the Sun.
- Explain how extra-solar planets give us a new view of our own Solar System.

Delivery and Resources

Lectures vs External mode

This unit is offered in S2, in Day and External modes. The only difference between these modes is that students enrolled in the external mode are not formally entitled to attend lectures. The lectures will be recorded and available on line along with the slides and there will be other supporting material including chat rooms and a forum on-line so this should not be a disadvantage. Students enrolled in the "External" offering are also very welcome -- nay,

encouraged -- to attend lectures. If room space is tight we will send out an iLearn announcement warning external enrolees that we cannot guarantee a lecture seat for the first few weeks of the semester. **External students must sit the final exam at one of the satellite locations on the same day and time as the final exam taken on campus. No exception can be made.**

Class times (Day mode only)

Lecture 1: Tuesday 9-10 AM 29 Wallys Wlk - T1

Lecture 2 and 3: Friday 10 AM-12 PM, 14 Sir Christopher Ondaatje Ave - Mason Theatre

Required and Recommended Texts and/or Materials

Required Text: Universe: The Solar System, Freedman and Kaufmann (5th Ed) **OR** Universe, Freedman, Geller and Kaufmann (10th Ed). The "Solar System" edition contains all the needed chapters, but you can also get the full textbook if you like. Recent editions of either book are suitable.

A list of recommended readings and web links will be provided as needed, and there is a wealth of supporting material available on the internet.

Technology Used and Required

Extensive use will be made of iLearn, both to deliver content and assessment materials, as well as to collect assessment. Students will therefore need computer / smart device and internet access.

Teaching and Learning Strategy

This unit is taught through lectures, on-line tutorials and live chatrooms and through undertaking one field experiment. We strongly encourage students to attend lectures because they provide a much more interactive and effective learning experience than studying a textbook, or listening to iLectures. However, this unit has been developed so that it can be taken remotely. As such it is possible to take it with no lecture attendance. Questions during the lectures, on the forums or during chat rooms with moderators are strongly encouraged in this unit. You should aim to read the relevant sections of the textbook before and after lectures and discuss the content with classmates.

You may wish to discuss your essays and other assessment with other students, but you are required to hand in your own work (see the note on plagiarism below). Several assignments are provided as one of the key learning activities for this unit, they are not there just for assessment. It is by applying knowledge learned from lectures and textbooks to solve problems that you are best able to test and develop your skills and understanding of the material.

Lectures will be presented using a data projector, with copies of the slides will be made available through iLearn. Lectures will be recorded and magically appear on the iLearn system.

Unit Schedule

Lectures

Week	Lecturer	Topics	Chapters*
Week 1	Dan	Introduction, orienting yourself in the night sky	1, 2
Week 2	Matt	The Sun, the Moon and the planets: overview, the early observers and the Scientific Method	3, 4
Week 3	Matt	The Earth and the Moon	7, 9, 10
Week 4	Dan	Terrestrial planets: Mercury, Venus and Mars	11
Week 5	Dan	Terrestrial planets 2	11
Week 6	Dan	Moons	13, 14.6-14.10
Week 7	Matt	Gas giants	12.1-12.11
		Mid-Semester Break	
Week 8	Matt	Gas giants, dwarf planets	14.1-14.5, 14.9,14.10
Week 9	Dan	Meteorites, asteroids, comets	15
Week 10	Dan	Extrasolar planets	4, 5, 6 as needed, 8.7
Week 11	Dan	Extrasolar planets 2 / Formation of the Solar System	4, 5, 6 as needed, 8.7, 18*, 8.1-8.6
Week 12	Dan / Matt	Formation of the solar system / Life in the Universe	18*, 8.1-8.6, 27
Week 13	Matt / Dan	Revision	

Chapters refer to those in either of the recommended books. The small amount of material in Chapter 18 (not in the "Solar System" book) will have equivalent iLearn readings.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public

- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@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

If you are a Global MBA student contact globalmba.support@mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
- Identify the physical processes that are in action on Earth and in our Solar System.
- Explain how we think our Solar System was born.
- Summarise what we know of planets around stars other than the Sun.
- Explain how extra-solar planets give us a new view of our own Solar System.

Assessment tasks

- Moon Practical
- Final Examination

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 using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.

- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
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- Explain how we think our Solar System was born.
- Summarise what we know of planets around stars other than the Sun.
- Explain how extra-solar planets give us a new view of our own Solar System.

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

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
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- Explain how extra-solar planets give us a new view of our own Solar System.

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

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these

differences/similarities inform about the origin of our Solar System.
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Assessment tasks

- Assignments
- Moon Practical
- Short answer assessment
- Final Examination

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

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
- Identify the physical processes that are in action on Earth and in our Solar System.
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Assessment tasks

- Assignments
- Moon Practical
- Short answer assessment
- Final Examination

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

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
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Assessment tasks

- Assignments
- Moon Practical
- Final Examination

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 using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
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- Explain how extra-solar planets give us a new view of our own Solar System.

Assessment tasks

- Short answer assessment
- Final Examination

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

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
- Identify the physical processes that are in action on Earth and in our Solar System.
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- Summarise what we know of planets around stars other than the Sun.
- Explain how extra-solar planets give us a new view of our own Solar System.

Assessment task

- Short answer assessment

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

- Explain how using the scientific method allows science advances though observation.
- Describe the content of our Solar System and how we have learned about it over time.
- Compare and contrast the planets in our Solar System and describe how these differences/similarities inform about the origin of our Solar System.
- Identify the physical processes that are in action on Earth and in our Solar System.

- Explain how we think our Solar System was born.
- Summarise what we know of planets around stars other than the Sun.
- Explain how extra-solar planets give us a new view of our own Solar System.

Changes from Previous Offering

Daniel Zucker and Matt Owers are continuing as lecturers from previous years. Daniel Zucker will be the course convenor this year, taking over from Devika Kamath.

The weighting of the Moon practical was increased to 20%, and the weighting of the final exam increased to 50%. The video project was eliminated.

Standards expectations

Academic Senate has deemed that the grades correspond to the following broad performance expectations:

Grade	Mark %	Description	
HD	High Distinction	85-100%	Denotes performance that meets all unit objectives in such an exceptional way and with such marked excellence that it deserves the highest level of recognition.
D	Distinction	75-84%	Denotes performance that clearly deserves a very high level of recognition as an excellent achievement in the unit.
Cr	Credit	65-74%	Denotes performance that is substantially better than would normally be expected of competent students in the unit.
P	Pass	50-64%	Denotes performance that satisfies unit objectives.
F	Fail	0-49%	Denotes that a candidate has failed to complete a unit satisfactorily

An aggregate standard number grade (SNG) corresponding to a pass (P) is required to pass this unit.

Some guidance on the qualitative distinctions between the grade levels follows.

Fail: does not provide evidence of attainment of all learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; and incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.

Pass: provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; and communication of information and ideas adequately in terms of the conventions of the

discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.

Credit: provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; plus communication of ideas fluently and clearly in terms of the conventions of the discipline.

Distinction: provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions, and the use of means of communication appropriate to the discipline and the audience.

High Distinction: provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application.

Changes since First Published

Date	Description
30/07/2019	Tuesday 9 - 10 AM lecture location corrected to 29 Wallys Walk T1.