



PHL 232

What is Science

S2 External 2017

Dept of Philosophy

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Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

General Information

Unit convenor and teaching staff Unit Convenor Karola Stotz karola.stotz@mq.edu.au Contact via karola.stotz@mq.edu.au Rel By appointment
Credit points 3
Prerequisites (12cp at 100 level or above) or admission to GDipArts
Corequisites
Co-badged status
Unit description How does science work? Should scientific method be privileged over other ways of knowing? How do scientific theories change over time? Should the history of science be seen as an unfolding tale of intellectual and technological progress, or as a messier and ambivalent process? This unit introduces central issues in the philosophy of science, including: the nature of observation and experiment; the question of scientific realism; the rationality or irrationality of scientific revolutions; the relation between science and values; and the nature of explanation. This unit presumes no particular background in science – it is suitable for students with a background in arts disciplines as well as for students in the social, behavioural, biological, and physical sciences.

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:

A working knowledge of some of the current major issues connecting philosophy and science

The ability to understand and critically evaluate the theories and arguments studied,

identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views

An ability to understand and critically evaluate theories and arguments in the philosophy of science.

An ability to express and expound the positions studied clearly and lucidly

Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

General Assessment Information

All tasks will be assessed using the criteria and learning outcome listed under the description of each task, such as: understanding, critical evaluation, written expression (etc). Each assessment will be graded using a rubric that will be available in gradebook.

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Participation</u>	20%	No	Weekly
<u>Weekly blog and reflection</u>	20%	No	Weekly
<u>Research Essay Plan</u>	10%	No	Week 10
<u>Short persuasive writing task</u>	15%	No	Week 6
<u>Research Essay</u>	35%	No	Week 13

Participation

Due: **Weekly**

Weighting: **20%**

The unit is held as a weekly 2-hour seminar, without tutorials. Internal students are required to attend 70% of all seminars or participate in discussion of required readings for each seminar.. Each week there will be required readings posted on iLearn. To each of these readings there will be some questions that are posted on the iLearn site.

Class participation marking criteria:

- **Outstanding contributor:** Contributions in class reflect extensive preparation. Ideas offered are usually substantive; provide major insights and direction for class discussion.

Challenges are substantiated and persuasive. Makes an important contribution to class discussion overall.

- **Good contributor:** Contributions in class reflect thorough preparation. Ideas offered are often substantive; provide useful insights and some direction for class discussion. Challenges are substantiated and often persuasive. Makes a significant contribution to class discussion overall.
- **Adequate contributor:** Contributions in class reflect adequate preparation. Ideas offered are sometimes substantive; provide some insight but rarely offer direction for class discussion. Challenges are sometimes presented, substantiated and persuasive. Makes a contribution to class discussion overall.
- **Unsatisfactory contributor:** Contributions in class reflect inadequate preparation. Ideas offered are rarely substantive; rarely provide insight but do not offer useful direction for class discussion. Contributions may be distractions rather than constructive. Does not make a positive contribution to class discussion overall.
- **Non-participant:** This person says little or nothing in class. There is not an adequate basis for evaluation. Makes no contribution to discussion.

(Adapted from Tyler, J. (2004) Class Participation Assessment Guide. Department of Education, Brown University).

External students should provide courteous and relevant feedback on the blog posts of at least two other students in 7 weeks of the semester. The marking criteria are the same as for internal students.

Submission: Weekly in-class (internal students), Weekly on iLearn (external students)

Grading: Students will receive a grade out of 10 for participation each week averaged over 10 best (an interim report on participation will be provided to all students at mid-semester)

On successful completion you will be able to:

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.
- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues

studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Weekly blog and reflection

Due: **Weekly**

Weighting: **20%**

All students are expected to complete a short weekly reflective blog post (100-200 words) on the reading material. These posts should be critical reflections on the reading (rather than summaries). The completion of at least 7 weekly blog posts is a requirement for this assessment. At the mid of the semester (week 6) students will select three of these posts on which to write a 750 word reflection which will be assessed.

This assessment task will be assessed by the following criteria set out in the following learning outcomes:

1. A working knowledge of some of the current major issues connecting philosophy and science
2. The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
3. An ability to understand and critically evaluate theories and arguments in the philosophy of science.
4. An ability to express and expound the positions studied clearly and lucidly
5. Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Submission: iLearn

Grading: Grading: Pass/10 for each submitted blog, fail/0 for not submitted Final grade: Pass (70 for 7 - 100 for 10) or fail

On successful completion you will be able to:

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.
- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues

studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Research Essay Plan

Due: **Week 10**

Weighting: **10%**

Students will produce a detailed plan of the research paper for peer review. An planning worksheet will be provided on iLearn.

This assessment task will be assessed by the following criteria set out in the following learning outcomes:

1. A working knowledge of some of the current major issues connecting philosophy and science
2. The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
3. An ability to understand and critically evaluate theories and arguments in the philosophy of science.
4. An ability to express and expound the positions studied clearly and lucidly
5. Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Submission Instructions for Internal Students: Students will bring their plan to tutorial in week 10 for peer feedback and discussion.

Submission Instructions for External Students: External students will post their essay plans to the external students forum and provide feedback on at least one other plan.

Feedback from convenor, some peer feedback .

Grading: Pass/Fail.

On successful completion you will be able to:

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.
- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues

studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Short persuasive writing task

Due: **Week 6**

Weighting: **15%**

All students will complete a 750 word persuasive writing piece on three of the weekly reflective posts. There will be instruction on how to complete such a task at the iLearn site.

This assessment task will be assessed by the following criteria set out in the following learning outcomes:

1. A working knowledge of some of the current major issues connecting philosophy and science
2. The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
3. An ability to understand and critically evaluate theories and arguments in the philosophy of science.
4. An ability to express and expound the positions studied clearly and lucidly
5. Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Submission: iLearn

Grading: Students will receive a grade out of 100 for the paper.

On successful completion you will be able to:

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.
- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Research Essay

Due: **Week 13**

Weighting: **35%**

Students will write a research paper of 2000 words which provides a careful critical examination, based on reasons, argumentation and evidence, of a set topic. A list of topics will be made available on iLearn in week 7, and the research paper must answer one of these set questions.

Submission: Turnitin submission on iLearn

Grading: Students will receive a grade out of 100 for the paper.

On successful completion you will be able to:

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.
- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Delivery and Resources

The lecture are held weekly on Fridays from 10-11am at W5C 335, and from 11-12 at E5A 130.

Tutorials will be held weekly, with the exception of Week 1 and Week 3. Time and place will be announced shortly.

The Readings will be listed on iLearn:

The main readings will be chapters from: • Peter Godfrey-Smith, *Theory and Reality: An Introduction to the Philosophy of Science* (Science and Its Conceptual Foundations series), University of Chicago Press

Additional Readings will be distributed prior to class: o Oppenheim, P., & Putnam, H. (1958). *The Unity of Science as a Working Hypothesis*. In H. Feigl, M. Scriven & G. Maxwell (Eds.), *Minnesota Studies in the Philosophy of Science* (Vol. II, pp. 3-36). Minneapolis: University of Minnesota Press. o Fodor, J. A. (1974). *Special sciences, Or the Disunity of Science as a Working Hypothesis*. *Synthese*, 28, 77-115. o Bechtel, W., & Abrahamsen, A. (2005). *Explanation: A Mechanistic Alternative*. *Studies in History and Philosophy of the Biological and Biomedical Sciences*, 36, 421-441. o Weber, M. (2005). *Philosophy of Experimental Biology*. Cambridge, New York: Cambridge University Press. (Chapter 2) o Woodward, J. (2001) "Law and Explanation in Biology: Invariance Is the Kind of Stability That Matters." *Philosophy of*

Science 68 (1): 1-20 o Woodward, J (2010) "Causation in biology: stability, specificity, and the choice of levels of explanation". Biol Philos 25:287–318

Useful additional reading: • Chalmers, A. F. What Is This Thing Called Science (Third Edition). Queensland: University of Queensland Press, 1999. • M. H. Salmon, J. Earman, C. Glymour and J. Lennox (eds), Introduction to the Philosophy of Science, Hackett Pub Co Inc; 1 edition (1999) • Hacking, Ian. An Introduction to Probability and Inductive Logic. Cambridge and New York: Cambridge University Press, 2001.

Unit Schedule

Date and Topic	Subtopics and Readings
Week 1: Background (Karola Stotz)	1.1 Chapter 1 Introduction
Week 2: Evidence and Testing	2.1 Chapter 2 Logic plus Empiricism 2.2 Chapter 3 Induction and Confirmation
Week 3: Popper; Causation (Karola Stotz)	3.1 Chapter 4 Popper: Conjecture& Refutation 3.2 Woodward 2010 Causation in Biology
Week 4: Scientific Change	4.1 Chapter 5 Kuhn and Normal Science 4.2 Chapter 6 Kuhn and Revolutions
Week 5: Theory Choice	Chapter 10 Naturalistic Philosophy in Theory and Praxis
Week 6: Social Organization of Science 1	6.1 Chapter 7 Lacatos, Laudon, Feyerabend ... 6.2 Chapter 8 The Challenge from Sociology of Science
Week 7: Social Organization of Science 2	7.1 Chapter 9 Feminism and Science Studies 7.2 Chapter 11 Naturalism and the Social Structure of Science
Week 8: Scientific debates: Reductionism, Unity and Autonomy of Science (Karola Stotz)	8.1 Oppenheim & Putnam 1958: The Unity of Science 8.2 Fodor 1974 Reductionism and the Autonomy of Science
Week 9: Scientific debates: Reductionism, Mechanisms and Emergence (Karola Stotz)	9.1 Mechanistic explanations (B&A 2005) 9.2 Reductionism, Laws and Mechanisms (Weber 2005)

Week 10: Explanations & Causal Explanations (Karola Stotz)	10.1 Chapter 13 Explanations 10.2 Woodward 2001 Causal Explanations
Week 11: Theory Choice 2	11.1 Hacking chs 11-19 The Theory of Probability 11.2 Chapter 14 Bayesianism and Modern Theories of Evidence
Week 12: Metaphysics and Philosophy of Science	12.1 Chapter 12 Scientific Realism 12.2 Chapter 15 Empiricism, Naturalism and Scientific Realism

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_2016.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

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](#)

Macquarie University provides a range of Student Support Services. Details of these services can be accessed at:

<http://www.deanofstudents.mq.edu.au/>

Or

<http://www.campuslife.mq.edu.au/campuswellbeing>

Another useful support service is provided by the Learning Skills unit which you can find at: <http://www.mq.edu.au/learningskills/>.

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.

Extensions and special consideration

Requests for extensions must be submitted in writing to the convenor at least 3 days prior to the final submission date accompanied by supporting documentation. Note, other study commitments will not be considered as an acceptable reason for requesting an extension. Email requests should include the unit code in the subject heading.

Where no extension has been granted, up to 5% of the total mark for that assessment may be deducted for each day the assignment is late, including weekends and public holidays.

Special Consideration Policy

http://www.mq.edu.au/policy/docs/special_consideration/policy.html

Applying for Special Consideration

Students applying for Special Consideration circumstances of three (3) consecutive days duration, within a study period, and/or prevent completion of a formal examination must submit an on-line application with the Faculty of Arts. For an application to be valid, it must include a completed Application for Special Consideration form and all supporting documentation.

The online Special Consideration application is found at: http://www.arts.mq.edu.au/current_students/undergraduate/admin_central/special_consideration.

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://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

- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Assessment tasks

- Participation
- Weekly blog and reflection
- Research Essay Plan
- Short persuasive writing task
- Research Essay

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 outcome

- An ability to express and expound the positions studied clearly and lucidly

Assessment tasks

- Participation
- Research Essay

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 outcome

- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views

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

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.
- Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Assessment tasks

- Participation
- Weekly blog and reflection
- Research Essay Plan
- Short persuasive writing task
- Research Essay

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

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.

- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Assessment tasks

- Participation
- Weekly blog and reflection
- Research Essay Plan
- Short persuasive writing task
- Research Essay

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

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.
- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Assessment tasks

- Weekly blog and reflection
- Research Essay Plan
- Research Essay

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

- A working knowledge of some of the current major issues connecting philosophy and science
- The ability to understand and critically evaluate the theories and arguments studied, identify their strengths and weaknesses, and develop an appreciation of the ways in which these positions have developed in response to identification of problems in other views
- An ability to understand and critically evaluate theories and arguments in the philosophy of science.
- An ability to express and expound the positions studied clearly and lucidly
- Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Assessment tasks

- Participation
- Weekly blog and reflection
- Research Essay Plan
- Short persuasive writing task
- Research Essay

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 outcome

- Students should start to develop their own philosophically informed views on the issues studied and defend their views, clearly and courteously in response to critical evaluation from others in discussion and in writing

Assessment tasks

- Participation
- Research Essay

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 outcome

- An ability to understand and critically evaluate theories and arguments in the philosophy of science.

Assessment task

- Participation

Changes since First Published

Date	Description
26/06/2017	Changed from lecture to seminar without tutorials.