### Department of Philosophy



#### PHIL 203/303-18S1 Dinosaurs, Quarks And Quasars: The Philosophy of Science

# Syllabus and Course Outline - 2019

#### **Contents:**

I. Course details
II. Topics and readings
III. Assessment
IV. General information

### I. Course details

### **Description:**

The methods of science are indisputably the best methods we have for understanding the universe. But what exactly are they? How does science work? This turns out to be an astoundingly difficult question, and scientists themselves often have only a slender grasp of the issues it raises. This course looks at a range of different answers that have been proposed and at why many of them are naive. Along the way it examines the hugely influential theories of Karl Popper and Thomas Kuhn, and examines other questions, including these: How do scientists develop theories, test them, and adjudicate between rival explanations of natural phenomena? Do the unobservable entities that scientists postulate – quarks, gluons, and their ilk – really exist, or are they merely predictively useful fictions? Should scientists try to verify their theories, or falsify them? What is scientific objectivity, and is it attainable? Has the past domination of science by white male scientists skewed its results? Is science an inherently *social* enterprise? By what criteria can genuine sciences, like Physics, Chemistry and Biology, be distinguished from pseudosciences like Astrology and Homeopathy? Is Science progressing slowly but steadily towards a grand, unified Theory of Everything, or is the idea of scientific progress just a myth?

The course will be of interest to anyone fascinated by Science, its history, its aims, and its methods. It will be valuable to scientists-in-training, in providing a broad perspective of the philosophical issues that hover over all scientific inquiry.

### PHIL 203 Learning outcomes:

- 1. The ability to demonstrate in-depth understanding of key philosophical concepts, and familiarity with a series of landmark theories and ideas in the Philosophy of Science.
- 2. An enhanced capacity to use logic and conceptual analysis to diagnose flaws in arguments, and a heightened appreciation for the importance of critical thinking.
- 3. An enhanced ability to work collaboratively with others in evaluating arguments.
- 4. The ability to develop independent research interests and goals.
- 5. An ability to write an essay that explains the key philosophical positions in a given area, which summarizes the principal arguments for and against each position, and which presents the writer's own point of view.

### PHIL 303 Learning outcomes:

- 1. The ability to demonstrate in-depth understanding of key philosophical concepts, and familiarity with a series of landmark theories and ideas in the Philosophy of Science.
- 2. An advanced capacity to use logic and conceptual analysis to diagnose flaws in arguments, and mastery of critical thinking techniques.
- 3. An enhanced ability to work collaboratively with others in evaluating arguments.
- 4. The ability to propose a research question and develop it through to a finished essay.
- 5. An ability to write an essay that explains the key philosophical positions in a given area, which summarizes the principal arguments for and against each position, and which presents the writer's own point of view.

# Course credit: 15 points, 0.125 EFTS

Contact hours: Three lecture hours per week (36 hours total).

# Lecturer and course coordinator

Dr. Douglas Campbell (Course coordinator)

- Department of Philosophy
- Karl Popper Building, Room 618, Phone (03) 364 2385 ext. 6859
- <u>douglas.campbell@canterbury.ac.nz</u>
- Office Hour: Friday, 1pm.

### **Required text:**

"Theory and Reality", Peter Godfrey-Smith.

### A useful supplementary text:

"What is this thing called science?", Alan Chalmers

### Learn:

There is a website for this course on Learn. The course outline, lecture hand-outs, reading materials, and similar materials, are posted on the site: <u>http://learn.canterbury.ac.nz</u>

# Assessment for PHIL203:

Item	Length	Weight	Due Date
Essay 1	1500-2000 words	35%	Midnight, last day of first
			term. (5 April 2019)
Essay 2	1500-2000 words	35%	Midnight, last day of
-			second term. (Friday 31
			May 2019)
Six online		5% each	Bi-weekly
assessment tasks			
Attendance		Up to	
		negative	
		5% if poor	

## Assessment for PHIL303:

Item	Length	Weight	Due Date
Essay 1	2500 words	35%	Midnight, last day of first
			term. (5 April 2019)
Essay 2	2500 words	35%	Midnight, last day of
			second term. (Friday 31
			May 2019)
Final exam	2 hours	30%	
Attendance		Up to	
		negative	
		5% if poor	

### II. An approximate itinerary

Weeks	Topic	Primary Reading					
WCCKS	Topic	(All readings are from the course tout)					
		(All readings are from the course text.)					
1 & 2	Philosophy of cosmology: The						
	multiverse and fine tuning						
3 & 4	Philosophy of biology: teleology, and						
	units of selection						
5&6	The problems of induction, and	Chapters 1 and 3, Course Text					
	observation						
7	The demarcation problem: the positivists,	Chapter 12, Course Text					
	Popper and 'creation science'.	Essay 1 due at end of this week					
3 week break							
8	The demarcation problem: the positivists,	Chapters 2 and 4, Course Text					
	Popper and 'creation science' (continued)						
9 & 10	The demarcation problem: Kuhn and the	Chapters 5, 6, 8, and 9, Course Text					
	historicist turn						
11 & 12	Scientific antirealism	Chapter 12, Course Text					
		Essay 2 due at end of this week					

### **III.** Assessment

#### A. Essay topics

Before you write your first philosophy essay, **make sure you look at the Philosophy Essay Writing Guide**, which is here: <u>http://learn.canterbury.ac.nz/course/view.php?id=1249</u>. It will help you *a lot* to get a good grade.

You can write your two essays on any topics discussed in class. You are welcome to make up your own essay question / topic, but you are also strongly encouraged to check your proposed topic with the lecturer. (Notice that all the following topics are *very broad*, and it many cases your essay would be improved if you focus in on just some narrow aspect of the topic. Please feel free to do this!) Possible essay topics include:

- 1. Is the "fine-tuning" of the fundamental physical constants best explained by positing a multiverse, or by positing a benevolent creator, or in some other way? Explain.
- 2. Is it legitimate to speak of biological traits as having teleological functions? Explain.
- 3. What are the units of biological selection—genes, or organisms, or groups, or some combination thereof? Explain.

- 4. Clearly explain one of the following three problems of induction in terms a layperson would understand, and evaluate how serious the problem is for the philosophical project of making sense of how science works.
  - a. Hume's problem of induction. (You might choose to focus one philospher's attempt to solve or dissolve Hume's problem—e.g., that of Bertrand Russell, or that or Hans Reichenbach, or that of Karl Popper.)
  - b. Goodman's "new riddle of induction".
  - c. Hempel's raven paradox.
- 5. Did [insert the name of a scientist here] fall prey to the theory ladenness of observation? You might choose to focus on Gregor Mendel (and his pea experiment), or on Eddington (and his eclipse observations), or on Le Verrier's prediction that a planet Vulcan would be found inside the orbit or Mercury, or any other example from the history of science you find interesting. (Instead of focusing on theory ladenness, you might instead focus on confirmation bias, or on the underdetermination of theory by evidence. You can write an essay in which you analyse any historical incident in science in terms of any one of these notions we have been covering in class.)
- 6. What is the verificationist theory of meaning? What are some reasons to think it is false or inadequate? (You might choose to focus on the question as to whether the verificationist theory is self-refuting.)
- 7. Karl Popper denied that there is any such thing as induction. Why did he say this? Was he right?
- 8. Critique Popper's falsificationist solution to the demarcation problem.
- 9. In what respects (if any) does Kuhn's philosophy of science improve on what came before it, and in what respects (if any) is it a step backwards?
- 10. The three major brands of feminist epistemology are feminist empiricism, feminist postmodernism, and feminist standpoint theory. Critically compare and contrast two of these, with a view to assessing their relative merits or plausibility.
- 11. Critically assess Bass van Fraassen's version of scientific antirealism ("constructive empiricism").

### **B. Essay Submission**

Essays are to be submitted on the Course's learn site. All essays will be scanned by TurnItIn.

### C. Extensions

Essays submitted after the due date, without an official extension, will be penalised (see below). Other than in exceptional circumstances, extensions must be sought before the due date.

### **D.** Penalties for Late Essays

Essays submitted after the due date and without an extension will attract a penalty of two percentage points per day or part thereof. Other than in exceptional circumstances, no essays submitted more than 14 days after the due date will be marked.

### E. Grades

The University of Canterbury uses the following scale to relate grades to marks and GPAs:

Grade	A +	Α	A -	B +	В	В-	C +	С	C-	D	Е
Marks	90-100	85-89	80-84	75-79	70-74	65-69	60-64	55-59	50-54	40-49	0-39
GPA	9	8	7	6	5	4	3	2	1	0	-1

Any grade over 50 is a pass.

#### F. Plagiarism and Other Forms of Dishonest Practice

Plagiarism occurs when passages of text are copied into an essay without being included in quotation marks and without sufficient acknowledgement of the source for the quotation. Minor variations to the wording of the original are not sufficient to avoid the charge of plagiarism. Plagiarism is regarded very seriously in the university, and may result in disciplinary action. Any essay in which significant plagiarism occurs will not be given a passing grade. If a substantial proportion of the essay is plagiarised, it will receive a zero grade. The Philosophy Department's policy is as follows:

Under no circumstances may you copy the words of an article or book without acknowledging it as a quotation. Nor may you copy or borrow extensively from the essays of other students, or have any other person write an essay for you. Be aware that we view these forms of cheating very seriously, and that we

regularly take steps to detect plagiarism in work submitted by students. If we find that that you have engaged in dishonest practice, you may be subject to disciplinary action. Penalties range from a failing grade on the specific item of assessment or the course as a whole to expulsion from the university.

If you have any doubts about whether you are appropriately referencing sources and material, the onus is on you to check your approach with lecturer or the Learning Skills Centre.

### G. Aegrotats

If you feel that illness, injury, bereavement or other critical circumstances has prevented you from completing an item of assessment or affected your performance, you should complete an aegrotat application form, available from the Registry or the Student Health and Counselling Service. This should be within seven days of the due date for the required work or the date of the examination. In the case of illness or injury, medical consultation should normally have taken place shortly before or within 24 hours after the due date for the required work, or the date of the test or examination. For further details on aegrotat applications, please refer to the *University of Canterbury Enrolment Handbook*. You have the right to appeal any decision made, including aegrotat decisions. Further information is available here:

www.canterbury.ac.nz/ucpolicy/GetPolicy.aspx?file=aegrotatconsiderationprocedure.pdf

## **IV. General information**

### **Student Representative**

Your class will appoint a student representative at the start of the semester. Further information is available here: http://ucsa.org.nz/support/

### **Students with Disabilities**

Students with disabilities should speak with someone at the Disability Support Service. Webpage: http://www.canterbury.ac.nz/disability/index.shtml Ext. 6350 Email: <u>disabilities@canterbury.ac.nz</u>