

# PHIL20617-02 – Philosophy of Science

T-R 12:30-1:45pm, DeBartolo Hall 231

**Instructor:** Xavi Lanao

**Email:** jlanaoca@nd.edu

**Office Hours:** W 12-2pm (or by appointment); 118 Malloy Hall

*A knowledge of the historic and philosophical background gives that kind of independence from prejudices of his generation from which most scientists are suffering. This independence created by philosophical insight is—in my opinion—mark of distinction between a mere artisan or specialist and a real seeker after truth. – Einstein to Thornton, 7 December 1944, EA 61-574*

**Course Description:** Scientific inquiry is often considered the method *par excellence* of acquiring knowledge about the world. What is it about science and its method that gives it this reputation? Is this reputation justified? In this introductory course to the Philosophy of Science we will explore these questions among others in an attempt to understand the relationship between scientific knowledge and the world. By the end of the course you will have the tools to critically reflect on whether it is possible to demarcate science from pseudoscience, the nature of the relationship between scientific theories and evidence, what the content of scientific theories is, how scientific models represent reality, the surprising fact that mathematics seems to provide accurate descriptions of the world, and the role of sociopolitical values in science in relation to the possibility of objective scientific knowledge. This course is self-contained; no previous familiarity with particular scientific or mathematical theories is required.

**Text(s):** all the required readings will be made available online.

## Learning Goals:

- Be familiar with some of the main debates in philosophy of science.
- Have a realistic and critical perspective on the nature of scientific activity and its relation to the world and society.
- Understand the prospects and challenges of science as a knowledge-producing activity.
- Be able to critically assess public debates regarding particular scientific studies and research programs.
- Be able to critically assess the relevance and social impact of particular scientific studies and research programs.

## Requirements:

- Participation and Attendance (25%)

*Everyone is expected to carefully read the article or book chapter assigned for each day and come prepared to discuss it and raise questions. You should be ready to engage in*

*active discussion of the text(s). For each session, there will be a short reading guide posted on Sakai which will include a few questions to help you focus on the central points or to help you reflect on some relevant aspect of the reading. The questions will be due 9 am of the day that the reading has been assigned.*

- Short Assignments (20%)

*There will be four written assignments (posted on Sakai) in the form of short papers (about 1 page) responding to a specific question or reacting to a short reading. The aim of these assignments is to apply the material covered in lectures to contemporary public and scientific debates.*

- Midterm Paper (25%)

*Short research paper (2000 words) on a pre-selected topic or question covered in the course. **Due Friday, October 16th.***

- Final Paper (30%)

*You can choose one of two options. The first option is to elaborate the midterm paper into a research paper (4000 words) that substantially builds on and incorporates the feedback given to the midterm paper. The second option is to write a whole new short research paper (2000 words) on a topic covered in the second half of the course. You are free to choose the topic but it should be approved by the instructor before the last day of class. **Due the day and time the university schedules the final; there will be no final exam.***

## Course Policies:

- **General**

- You are expected to behave ethically. You are encouraged to ask questions, respond to other students points, and raise issues for discussion. Everyone is expected to treat their fellow students and professor critically but respectfully.
- You are expected to attend class on a regular basis. Every unexcused absence after the first one will be penalized.
- You are to have done the assigned readings prior to each class meeting (see below for the list of readings). I also expect each of you to make frequent, quality contributions to class discussion.

- **Assignments**

- You are expected to work independently on the essays and assignments. Discussion amongst students is encouraged, but when in doubt, direct your questions to me.
- Late assignments will be penalized with half a letter grade per day. In case there are special circumstances, please come talk to me preferably before the deadline.

- **Academic Integrity**

- As a member of the Notre Dame community, I will not participate in or tolerate academic dishonesty. Please take advantage of the aid I can give you rather than resorting to academic dishonesty.

- It is your responsibility to familiarize yourself with the Academic Honor Code (<http://fys.nd.edu/current-students/honor-code/>).

**Tentative Course Outline:** The weekly coverage might change as it depends on the progress of the class. However, you must keep up with the reading assignments.

<b>Unit 0: Introduction</b>
<p><b>Philosophy, Science and Philosophy of Science</b>  <i>Aug 25th</i> – Stemwedel, “What Is Philosophy of Science (and Why Should Scientists Care)?” and Feynman, “The Value of Science”</p>
<b>Unit 1: What is Science?</b>
<p><b>Demarcating Science (from Pseudoscience)</b>  <i>Aug 27th</i> – Hempel, “Problems and Changes in the Empiricist Criterion of Meaning”  <i>Sep 1st</i> – Popper, “Science: Conjectures and Refutations”</p>
<p><b>Challenges to Demarcation Criteria</b>  <i>Sep 3rd</i> – Kuhn, “Logic of Discovery, or Psychology of Research?”  <i>Sep 8th</i> – Laudan, “The Demise of the Demarcation Problem”</p>
<b>Unit 2: Scientific Theories and Evidence</b>
<p><b>Induction and Confirmation</b>  <i>Sep 10th</i> – Salmon, “An Encounter with David Hume”  <i>Sep 15th</i> – Hempel, “Studies in the Logic of Confirmation”, sec. 1-5.</p>
<p><b>Challenges to Confirmation Theories</b>  <i>Sep 17th</i> – Goodman, “The New Riddle of Induction”  <i>Sep 22nd</i> – Laudan and Leplin, “Empirical Equivalence and Underdetermination”  <i>Sep 24th</i> – Brewer and Lambert, “The Theory-Ladenness of Observation and the Theory-Ladenness of the Rest of the Scientific Process”</p>
<p><b>Sofisticated Theories of Confirmation</b>  <i>Sep 29th</i> – Glymour, “Relevant Evidence”  <i>Oct 1st</i> – Lipton, <i>Inference to the Best Explanation</i>, ch. 4.</p>
<b>Unit 3: Science, Truth and Reality</b>
<p><b>Naive Realism: Motivation and Problems</b>  <i>Oct 6th</i> – Boyd, “On the current status of the issue of scientific realism”, sec. 1-3 &amp; 6.  <i>Oct 8th</i> – Laudan, “A Confutation of Convergent Realism”</p>

**Alternatives to Naive Realism**

- Oct 13th* – Worrall, “Structural Realism”  
*Oct 15th* – van Fraassen, *The Scientific Image*, ch. 1 & 2.  
*Oct 16th* – \*Mid-term Paper Due\*  
*Oct 20th* – \*Fall Break – No Class\*  
*Oct 22nd* – \*Fall Break – No Class\*  
*Oct 27th* – Cartwright, “The Reality of Causes in a World of Instrumental Laws”

**Scientific Representation beyond Theories**

- Oct 29th* – Morrison and Morgan, “Models as Mediating Instruments”  
*Nov 3rd* – Wigner, “The Unreasonable Effectiveness of Mathematics in Natural Sciences”

**Unit 4: Science, Values and Objectivity****Is Science Value Free?**

- Nov 5th* – McMullin, “Science and Values”  
*Nov 10th* – Longino, “Gender, Politics, and the Theoretical Virtues”  
*Nov 12th* – Douglas, “Rejecting the Ideal of Value-Free Science”

**Can Science Be Objective?**

- Nov 17th* – Kourany, “A Successor to the Realism/Antirealism Question”  
*Nov 19th* – Okruhlik, “Gender and the Biological Sciences”  
*Nov 24th* – Longino, “Values and Objectivity”  
*Nov 26th* – \*Thanksgiving – No Class\*

**Science and Democracy**

- Dec 1st* – Kitcher, “Well-Ordered Science”  
*Dec 3rd* – Proctor, “Agnotology: A Missing Term To Describe The Cultural Production Of Ignorance (And Its Study)”  
*Dec 8th* – Douglas, “Inserting the Public into Science”

**Unit 00: Conclusion****Philosophy, Science and Philosophy of Science (revisited)**

- Dec 10th* – “Excerpts on Philosophy vs. Science”; re-read Stemwedel and Feynman.

*This syllabus was last updated August 8, 2016*