# PHIL 12: Scientific Reasoning

John Dougherty                                                                          Spring 2015

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|--------------|------------------------------------------|
| Schedule:    | MW 9:00–9:50, CENTR 119                  |
| Sections:    | A01 M 2:00–2:50, SEQUO 147               |
|              | A03 W 4:00–4:50, WLH 2206                |
| Website:     | `http://acsweb.ucsd.edu/~jedoughe`       |
| Email:       | `jedoughe@ucsd.edu`                      |
| Office Hours:| MW 11:00–12:00, HSS 8085                 |
| TA:          | Sindhuja Bhakthavatsalam                 |
|              | OH: MW 10:00–11:00, Mandeville coffee cart |
|              | `sbhaktha@ucsd.edu`                      |

In this course, we will investigate the kinds of reasoning involved in the pursuit of scientific knowledge. You will learn how to identify and apply the tools of scientific reasoning—deduction, induction, and statistical methods, for example. You will then put these skills to use in critically evaluating scientific claims in context. Finally, we will consider some of the philosophical underpinnings of these methods, their results, and challenges that they raise. How, for example, can we come to know about unobservables like quarks and causal connections? When should we believe the results of these scientific methods, and what can we do when we shouldn't?

Because this is a philosophy course, we will primarily be interested in philosophical questions about the nature and justification of scientific knowledge. In order to tackle these, we will have to get familiar with some basic technical tools. These tools will give us the ability to make our questions more precise and formulate better answers. Our discussion will, however, remain relatively qualitative. What you should take away from the course, in the end, is a better understanding of how scientific reasoning actually proceeds, along with an idea of what counts as good scientific reasoning.

## Course materials

The text for this course is Robert Martin's *Scientific Thinking* (ISBN 978-1551111308), available at the bookstore. It is required. Any other readings will be made available online at the website listed above.

## Course policies

**Assessment**   Your final grade will be based on the following:

- Attendance (10%): You are required to attend your discussion section.

- Short assignments (15%): There will be two short assignments due April 20th and May 11th.

- In-class exam (40%): June 3

- Term paper (35%): Due date TBA

The short assignments will be due in lecture on Mondays. There will be a 3 mark penalty for late work turned in at the following Wednesday lecture, and a 5 mark penalty for work turned in after that.

**Grading**   Your assessments will be given a letter grade. The final letter grade you receive will be calculated using the percentages above, but will also be curved. The top 25–30% of grades will be in the A range, the next 25–35% in the B range, the next 25–30% in the C range, and the remaining 5–25% will be a D or an F. If the class has worked well and no one deserves a D or F, the curve will be adjusted accordingly.

## Tentative schedule of classes

| Week | Date | Topic |
| --- | --- | --- |
| 1 | 30 March | Introduction and overview |
| 1 | 1 April | Introduction to argument |
| 2 | 6 April | Deductive arguments |
| 2 | 8 April | Inductive arguments |
| 3 | 13 April | Inductive generalization: polling and sampling |
| 3 | 15 April | Imprecision and confidence level |
| 4 | 20 April | Correlations and statistical significance |
| 4 | 22 April | Introduction to causation |
| 5 | 27 April | Mill's methods for inferring causes |
| 5 | 29 April | Clinical Methods 1: clinical trials |
| 6 | 4 May | Clinical Methods 2: animal testing |
| 6 | 6 May | Review of causation and clinical methods |
| 7 | 11 May | Confirmation of hypotheses: the HD model |
| 7 | 13 May | HD and the Quine–Duhem problem |
| 8 | 18 May | HD and underdetermination |
| 8 | 20 May | Inference to the best explanation |
| 9 | 25 May | *Memorial Day Observance, no class* |
| 9 | 27 May | Hume's problem of induction |
| 10 | 1 June | The problem of induction 2 |
| 10 | 3 June | Exam |