

# PHIL 24 Science v Pseudoscience



Today more than ever before we are bombarded by information dressed in scientific garb. While some of it is silly and mostly harmless, e.g., Bigfoot, much of it is tremendously costly to individuals and society, e.g., AIDS pseudoscience, the anti-vax movement, “cures” for cancer, climate science denialism. Typically sources of misinformation want something from us, ranging from a purchase (e.g., should I buy “performance” wristbands?) to a belief (e.g., what medicine should I take?) to a vote (e.g., against climate change mitigation). Often pervaders of misinformation target the most vulnerable in society.

Not all scientific-looking information is equal. With Hollywood stars, social media, conspiracy fans, dark money, industries, and fake academic journals flooding us with so much misinformation and disinformation, how are we supposed to make informed rational judgments?

Take this course! We’ll see that we face not a bimodal 'science or not-science' choice, but a question of how we ought to apportion our rational confidence along a spectrum of more or less trustworthy claims. The goal of the course is to help you in this lifelong project by identifying some common pitfalls and helpful techniques.

We’ll approach this topic in a very much “hand’s on” way. That is, most of the assignments will ask you to do some (light) independent research (see below). The expectation is that if you make the work “your own” you’ll dive deeper and remember the lessons longer. In addition, it will be more fun.

**Instructor** Professor Craig Callender  
craigcallender.com  
[ccallender@ucsd.edu](mailto:ccallender@ucsd.edu)  
Office hrs: Wed 330-430 in RWAC 456

**TA:** Haggeo Cardenas  
[hcadenas@ucsd.edu](mailto:hcadenas@ucsd.edu)  
Office hrs: TBD in RWAC 4XX

**Coordinates** MW 5-6:20pm in RWAC 103

## Reading

You should buy the paperbacks:

- *Bad Science: Quacks, Hacks and Big Pharma Hacks*, Ben Goldacre.
- *On the Fringe: Where Science Meets Pseudoscience*, Michael Gordin

Everything else will be electronically available either straight from links on this syllabus or via Canvas (or both).

## Class format and environment

Come to class prepared for discussion. This means carefully reading everything assigned for the day *prior to coming to class*.

Many of the topics discussed are controversial. You or loved ones are bound to have some controversial beliefs, e.g., ghosts, homeopathy. Good rigorous argumentation is okay, even if sometimes heated; just make sure the eye is always on the ball, i.e., on evidence and defending claims, never slander, innuendo, and so on. Don't remain silent just because you perceive your opinions to diverge from the instructor's or majority's. The whole point of this class is to get evidence and argument out in the open.

Be respectful of the learning environment. The use of laptops, smartphones, iPads, etc *is prohibited* unless used for note-taking or reading class assignments.

## Grading

Small Projects	40%
Discussions	20%
Participation	5%

“Debunking” Final Report:	15%
“Debunking” Group Presentation:	20%

## **Fine Print**

In your reports, homework, etc., all sources, including discussions with classmates, use of AI, must be appropriately acknowledged. All answers given must be in your own wording. Closely paraphrasing or simply copying the work of others (such as authors of books or articles, or classmates) is not allowed and will be severely penalized. You must ask me in case you are uncertain whether something constitutes plagiarism. Plagiarism, the stealing of an idea or actual text, and other forms of academic dishonesty will be immediately reported to the Academic Integrity Office. Students agree that by taking this course all required papers will be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the terms of use agreement posted on the Turnitin.com site. You must observe the University’s Policy on Integrity of Scholarship, which can be found at <http://www-senate.ucsd.edu/manual/appendices/app2.htm>. Late assignments will be accepted, but docked at the rate of 5% per day.

## **Sample Schedule, Topics and Readings<sup>1</sup>**

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Demarcation: Distinguishing Science from Pseudoscience

### **1. Introduction: Big Foot, Detox, Denialism**

- Goldacre, chapter 1
- Laycock, [“A Search for Mysteries and Monsters in Small Town America”](#)
- Further reading. Radford, [Bigfoot at 50](#), [Pew Research Center](#)

### **2. Marx, Freud and Astrology: Sir Karl Popper’s Demarcation Criterion**

- Popper, [“Conjectures and Refutations”](#)
- Gordin, chapter 1 and 2
- Further reading. Thagard, [“Why Astrology is a Pseudoscience”](#), The Case of Astrology: Derren Brown video, Kelly, I. W., “Modern Astrology: A Critique”

### **3. Homeopathy, Alternative Medicine, and “Facsimile” Science**

- Goldacre, Homeopathy, chapter 4
- Oreskes, Systematicity is Necessary but not Sufficient: On the Problem of Facsimile Science

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<sup>1</sup> The official syllabus will always be on Canvas under Files and updated periodically.

- Further reading. Smith, *Pseudoscience and Extraordinary Claims*, chap 13, Mukerji and Ernst, *Why Homeopathy is a Pseudoscience*

#### **4. Creationism and the Scientific Method**

- Kitcher, [Believing Where We Cannot Prove](#)
- Gordin, 47-51
- Further reading. Lane, "Sight" in *Life Ascending: The Ten Great Inventions of Evolution*

#### **5. The Practical Demarcation Problem**

- Resnick, [The Practical Demarcation Problem](#)
- Burke, [Stop Using the Word Pseudoscience](#)
- Further reading. Haack, [Trial and Error: The Supreme Court's Philosophy of Science](#). Hirvonen and Karisto, [Demarcation without Dogmas](#).

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Why Do We Get it Wrong ?

#### **6. Placebos and Randomized Control Trials**

- Goldacre, *Homeopathy; The Placebo Effect*, chapters 4 and 5
- Further reading: Smith & Pell, [Parachute Use to Prevent Death and Major Trauma Related to Gravitational Challenge: Systematic Review of Randomised Controlled Trials](#); BBC News, 2003: ["Alien 'abductees' show real symptoms"](#)

#### **7. Placebos and randomized Control Trials**

- Cartwright, [A philosopher's view of the long road from RCTs to effectiveness](#)
- Worrall, [The placebo effect and evidence-based policy](#)
- Worrall, [The ethical homeopathic placebo?](#)

#### **8. Causation vs Correlation: Nutritionism**

- Goldacre, *Nutritionists*, chapter 7
- Aschwanden, [You Can't Trust What You Read About Nutrition](#)
- Further reading. Matute, Yarritu, & Vadillo, [Illusions of causality at the heart of pseudoscience](#), Mueller, J. (2007) ["Correlations or Causation"](#)

#### **9. Why Clever People Believe Stupid Things**

- Goldacre, chapter 10

- Psychological Drivers, tbd

## **10. Replication and Methodology**

- Goldacre, Bad Stats, chapter 11
- Aschwanden, [Science Isn't Broken: It's Just a Hell of a Lot Harder Than We Give it Credit For](#).

## **10. Anti-Vaxx**

- TBD
- Further reading. Meek, [Red Pill, Blue Pill](#), Goldenburg, [Vaccines, Values and Science](#)

## **11. Flat Earth, and More**

- *Behind the Curve*
- UFOology and evangelicalism, tbd
- Ashley Landrum paper, tbd

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## **Dark Money and Disinformation**

### **12. Big Pharma**

- Goldacre, Is Mainstream Medicine Evil? chapter 9
- (Stegenga, [Gentle medicine could radically transform medical practice](#))

### **13. Climate Denialism**

- Michaels, The Climate Denial Machine (in Files on Canvas)
- Cook, Supran, Lewandowsky, Oreskes, Maibach, "[America Misled](#)"
- Callender, Fossil Fuel Money is Warping Climate Research

### **14. Sugar**

- Michaels, Sickeningly Sweet (in Files on Canvas)
- (O'Connor & Weatherall, [How Powerful Interests Use Science to Sway Public Opinion](#) )

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## What Can We Do?

### 15. Psychology and the Infodemic

- Shane, [The Psychology of Misinformation: Why We're Vulnerable](#)
- Shane: [The Psychology of Misinformation: Why it's So Hard to Correct](#)
- Further reading. Weir, [Why We Believe Alternative Facts](#)

### 16. Pre-bunking and Other Strategies

- [Immersive Truth](#) (selection)
- [getbadnews.com](#)
- [goviralgame.com](#)
- [newslit.org/tips-tools/quiz-should-you-share-it/](#)
- A toolkit for understanding and addressing climate scepticism

### 17. Identifying Bogus Websites, Dark Money, Etc

- [Sort Fact From Fiction Online with Lateral Reading](#)
- reading tbd
- Further reading. WHO: [How to report online misinformation](#)

### 18. Guest Lecturer: [Jamy Ian Swiss](#)

- Web, [Why Did So Many Victorians Try to Speak to the Dead?](#)
- Smith, Pseudoscience and Extraordinary Claims of the Paranormal, chapter 7

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## Resources

The topics covered in this course generate many books, articles, video and blogs. Some are dreadful, but others are good. The websites below may be quite helpful.

[sciencebasedmedicine.org](#)  
[www.nbtiller.com/skepticism](#)  
[skepticalinquirer.org](#)  
[www.theskepticsguide.org](#)  
[skepdic.com](#)  
[www.skeptic.com](#)  
[www.quackwatch.com](#)  
[gimletmedia.com/shows/science-vs](#)  
[snopes.com](#)

[skepticblog.org](http://skepticblog.org) (defunct, but good old posts)

[www.randi.org](http://www.randi.org) (defunct, but good old education modules)

[desmog.com](http://desmog.com) (for dark money)

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