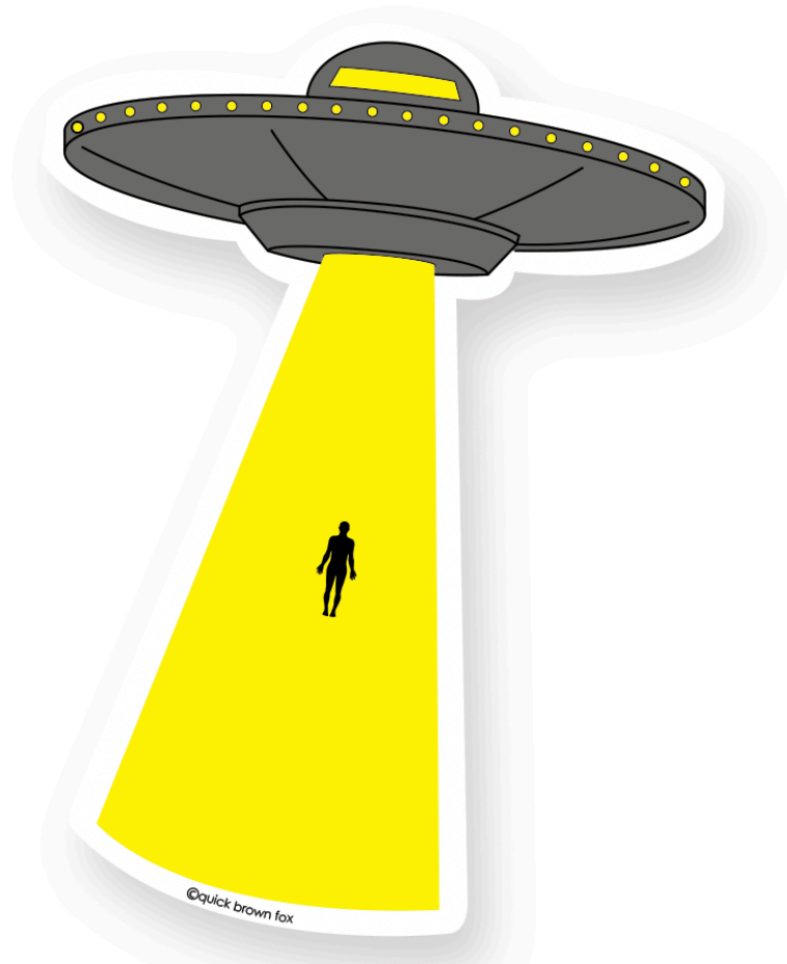


PHIL 24 Winter 2025

# SCIENCE VS PSEUDOSCIENCE

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PROFESSOR CRAIG CALLENDER



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Today more than ever before we are bombarded by information dressed in scientific garb. Some of it is silly and mostly harmless, e.g., Bigfoot, but much of it is very costly to individuals and society, e.g., AIDS pseudoscience, the anti-vax movement, “cures” for cancer, climate science denialism. Typically sources of disinformation want something from you, 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 purveyors of disinformation target the most vulnerable in society.

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

Take this course! You’ll learn 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. 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.

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**Coordinates**            MW 5-6:20pm in SOLIS 104

## Reading

You should buy the paperbacks (or Kindle):

- *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 straight from links on this syllabus or via Canvas (or both). Another useful book – but not required – is Bergstrom and West, *Calling Bullshit*.

## 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; just make sure the eye is always on the ball, i.e., on evidence and defending claims, never slander or innuendo. 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 30%

- Pharmacy project
- Headline Game project
- Placebo project
- Dark Influences project

Discussions 20%

Participation/attendance 5%

"Debunking" Group project 25%

Final Exam 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

"Further reading" is not mandatory for the course. Often lecture will mention content in these readings; for those interested, the citation is provided.

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Demarcation: Distinguishing Science from Pseudoscience

### 1. Detox, Dowsing, and Disinformation: An Introduction

- Goldacre, chapter 1
- [Pew Research Center](#)

### 2. Bigfoot and Other Cryptids

- [Evidence](#) for San Diegan Bigfoot (also, the [Borrego Sandman](#))
- Hardy, [What Bigfoot Teaches Us About Public Mistrust of Science](#)
- Laycock, [A Search for Mysteries and Monsters in Small Town America](#)
- Further reading. Radford, [Bigfoot at 50](#)



AK Wall Art

### 3. 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"

### 4. Homeopathy, Alternative Medicine, and "Facsimile" Science

- Goldacre, Homeopathy, chapter 4
- Oreskes, Systematicity is Necessary but not Sufficient: On the Problem of Facsimile Science
- Further reading. Smith, *Pseudoscience and Extraordinary Claims*, chap 13, Mukerji and Ernst, Why Homeopathy is a Pseudoscience



### 5. Creationism and the Scientific Method

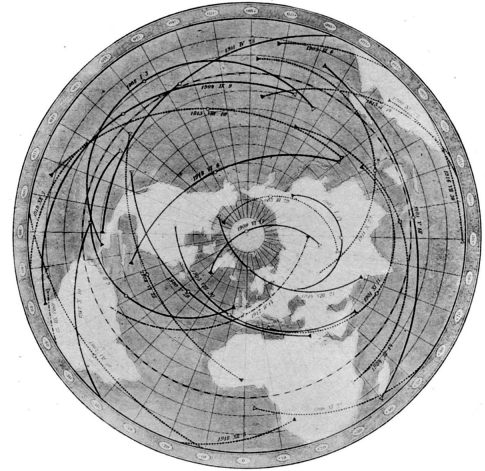
- Kitcher, [Believing Where We Cannot Prove](#)
- Gordin, 47-51
- Further reading. Lane, "Sight" in *Life Ascending: The Ten Great Inventions of Evolution*

### 6. 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](#).

## 7. Flat Earth

- *Behind the Curve*, the film
- "Flat earth" section, chapter 4, Gordon
- Brashier, [Do Conspiracy Theorists Think too Much or Too Little?](#)
- Further reading. Landrum, *Flat-Smacked! Converting to Flat Earthism*



## 8. Anti-Vaxx

- Goldacre, *The MMR Hoax*
- Goldenburg, [A Feminist Take on Vaccine Hesitancy](#)
- Further reading. Meek, [Red Pill, Blue Pill](#), Goldenburg, [Vaccines, Values and Science](#). North, [The Long Strange History of Anti-Vaccination Movements](#)

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Why Do We Get it Wrong ?

## 9. Placebos, Randomized Control Trials, and Homeopathy

- Goldacre, *Homeopathy; The Placebo Effect*, chapters 4 and 5
- Cartwright, [A philosopher's view of the long road from RCTs to effectiveness](#)
- Worrall, [The placebo effect and evidence-based policy](#)
- 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"](#) Worrall, [The ethical homeopathic placebo?](#)

## 10. Causation vs Correlation: Nutritionism

- Goldacre, chapters 6,7
- Aschwanden, [You Can't Trust What You Read About Nutrition](#)



- Further reading. Bergstrom and West, *Calling Bullshit*, chapter 4; Matute, Yarritu, & Vadillo, [Illusions of causality at the heart of pseudoscience](#), Mueller, J. (2007) "[Correlations or Causation](#)"

## 11. Biases

- Goldacre, *Why People Believe Weird Things*, chapter 10

## 12. Cold reading, Seances and the Paranormal

- Swiss, *Spooky Science in The Conjuror's Conundrum*
- Smith, *Pseudoscience and Extraordinary Claims of the Paranormal*, chapter 7
- Further reading. Web, *Why Did So Many Victorians Try to Speak to the Dead?*



Julianne Alexander

## 13. Replication and Methodology

- Goldacre, *Bad Stats*, chapter 11
- Bergstrom and West, *Calling Bullshit*, chapter 9
- Further reading. Aschwanden, [Science Isn't Broken: It's Just a Hell of a Lot Harder Than We Give it Credit For.](#)

## 14. Calling Bullshit on Big Data

- Bergstrom and West, *Calling Bullshit*, chapter 8

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Dark Money and Disinformation

## 15. The Tobacco Strategy

- *Merchants of Doubt*, the film

## 16. Climate Denialism

- Michaels, *The Climate Denial Machine* (in Files on Canvas)
- Cook, Supran, Lewandowsky, Oreskes, Maibach, "[America Misled](#)".
- Callender, [Fighting Disinformation with Sunshine](#)
- Further reading. Oreskes and Conway, *Merchants of Doubt*, (the book), Callender, *Fossil Fuel Money is Warping Climate Research* (on Canvas), Jacquet, *The Playbook*, O'Connor & Weatherall, [How Powerful Interests Use Science to Sway Public Opinion](#)



## 17. Big Pharma

- Goldacre, *Is Mainstream Medicine Evil?* chapter 9
- Horgan, [Is Medicine Overrated?](#)
- Further reading. Stegenga, [Gentle medicine could radically transform medical practice](#)

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What Can We Do?

## 18. The Infodemic, Pre-Bunking, and More

- Williams, [Misinformation is the Symptom, Not the Disease](#)
- 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 Immersive Truth](#) (selection) [getbadnews.com](#) [goviralgame.com](#) [newslit.org/tips-tools/quiz-should-you-share-it/](#) [Sort Fact From Fiction Online with Lateral Reading](#)
- WHO: [How to report online misinformation](#)



## 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 helpful.

[sciencebasedmedicine.org](http://sciencebasedmedicine.org)

[callingbullshit.org](http://callingbullshit.org)

[www.nbtiller.com/skepticism](http://www.nbtiller.com/skepticism)

[skepticalinquirer.org](http://skepticalinquirer.org)

[www.theskepticsguide.org](http://www.theskepticsguide.org)

[skepdic.com](http://skepdic.com)

[www.skeptic.com](http://www.skeptic.com)

[www.quackwatch.com](http://www.quackwatch.com)

[gimletmedia.com/shows/science-vs](http://gimletmedia.com/shows/science-vs)

[snopes.com](http://snopes.com)

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

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

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

[www.wisdomofchopra.com](http://www.wisdomofchopra.com) (for random “profound” quotes)

