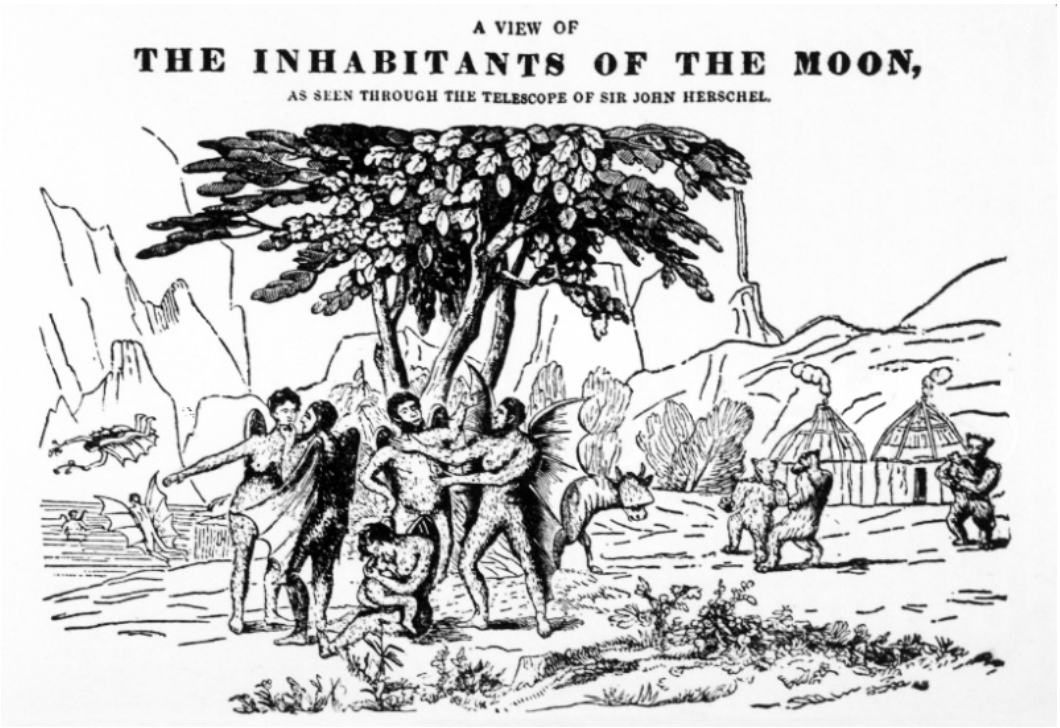
PHIL 24 Science vs Pseudoscience

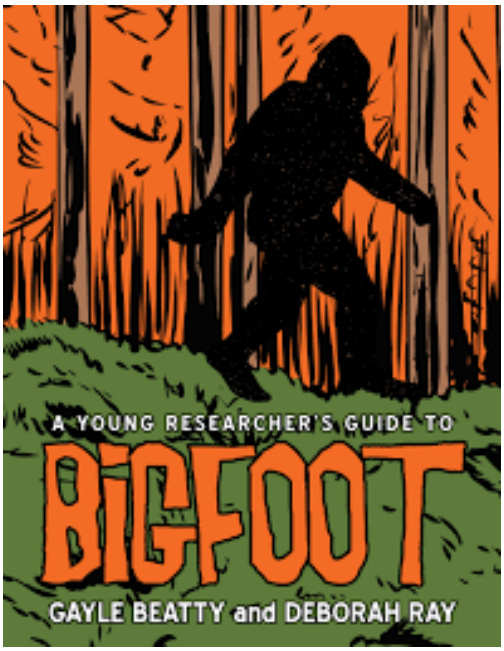


New York Sun, Great Moon hoax, 1835

Today more than ever before we are bombarded by information dressed in scientific garb. While some of it is silly and harmless, e.g., Bigfoot, much of it is tremendously costly to individuals and society, e.g., AIDS pseudoscience, fake bomb detectors, anti-vax conspiracy theories, cures for cancer, science denialism. The sources 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 these groups target the most vulnerable in society, such as the sick, uneducated and poor.

Not all scientific-looking information is equal. With Oprah, Hollywood stars, mainstream news organizations, conspiracy fans, dark money, pharmacies and fake academic journals flooding us with so much pseudoscience, how are we consumers of this information 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 outcomes. The goal of the course is to help you in this lifelong project by identifying some common techniques and pitfalls.



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

Coordinates MW 5-6:20pm in Solis 107

Office hrs tbd

Reading

You should buy the paperback:

- *Bad Science: Quacks, Hacks and Big Pharma Hacks*, Ben Goldacre.

I've seen used copies for sale for as low as $3.88. We'll also use parts of

- *Pseudoscience and Extraordinary Claims of the Paranormal: A Critical Thinker's Toolkit*, 2010, by Jonathan C. Smith

The library has this book for free electronically, but if you want a hard copy it's not a bad investment. 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

Homework and Small Projects:	60%
Participation	5%
"Debunking" Final Report:	20%
"Debunking" Presentation:	15%

Fine Print

In your reports, homework, etc., all sources, including discussions with classmates, 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.

Tentative Schedule, Topics and Readings
(Readings in parentheses are merely suggested extras.)

Demarcation: Distinguishing Science from Pseudoscience

1. Introduction: Detox, Dowsing, and Denialism

- Goldacre, chapter 1
- Spring, "The Human Cost of Virus Misinformation"
- Spring and Wendling, "How Covid-19 Myths are Merging with the QAnon Conspiracy Theory"
- Don't get cocky: take Pew Research Center Science Knowledge Quiz
- Take personality test: https://www.16personalities.com/free-personality-test
- Take food and activity questionnaire (emailed)

2. The Philosophical Demarcation Problem: Sir Karl Popper

- Popper, "Conjectures and Refutations"
- Glymour, "How Freud Left Science"
- detoxing Barbie

3. Astrology and Demarcation: Responses to Popper

- Thagard, "Why Astrology is a Pseudoscience"
- Burke, Stop Using the Word Pseudoscience
- The Case of Astrology: Derren Brown video
- (Lakatos, "Science and Pseudoscience")
- (Kelly, I. W., "Modern Astrology: A Critique")

4. The Practical Demarcation Problem

- Resnick, The Practical Demarcation Problem
- Haack, Trial and Error: The Supreme Court's Philosophy of Science

5. Creationism, Evolution, and the Scientific Method

- Kitcher, Believing Where We Cannot Prove
- Lane, "Sight" in Life Ascending: The Ten Great Inventions of Evolution. (Canvas Files)
- (Strevens, Keep Science Irrational)

Why Do We Get it Wrong ?

7. Placebos and Homeopathy

- Goldacre, Homeopathy; The Placebo Effect, chapters 4 and 5
- BBC News, 2003: "Alien 'abductees' show real symptoms"

8. Causation vs Correlation: Nutritionism

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

8. 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.
- Smith & Pell, Parachute Use to Prevent Death and Major Trauma Related to Gravitational Challenge: Systematic Review of Randomised Controlled Trials

9. Why Clever People Believe Stupid Things

- Goldacre, chapter 10

Famous or Useful Cases

10. Personality Tests

- Stein and Swan, Evaluating the Validity of Myers-Briggs Type Indicator Theory: A Teaching Tool and Window into Intuitive Psychology (in Files on Canvas)
- (Le Cunff, The Comforting Pseudoscience of the MBTI)
- Retake personality test from week 1

11. How to Spot Quantum Mumbo Jumbo

- Hassani, Sources of Quantum Voodooism
- Callender, Nothing to See Here: Demoting the Uncertainty Principle

Dark Money and Merchants of Doubt

12. Big Pharma

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

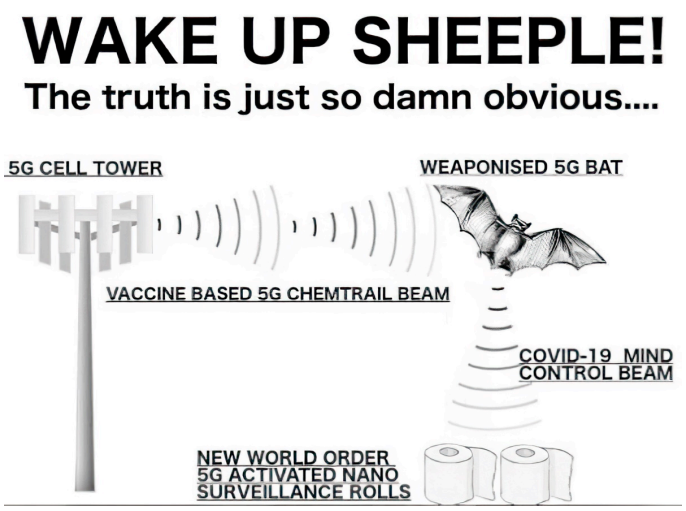
13. Climate Denialism

- Michaels, The Climate Denial Machine (in Files on Canvas)
- Cook, Supran, Lewandowsky, Oreskes, Maibach, "America Misled"

14. Sugar

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

Miscommunication, Motivated Reasoning, and Conspiracies



15. Anti-Vaxx

- Goldacre, The Media's MMR Hoax, chapter 12
- (Meek, Red Pill, Blue Pill)

16. Vaccines, Flat Earth, Values and Trust

- Goldenburg, Vaccines, Values and Science
- Watch *Behind the Curve*

17. 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
- (Weir, Why We Believe Alternative Facts)
- Student presentations (2)

18. Pre-bunking and Other Strategies

- reading tbd
- getbadnews.com
- goviralgame.com
- newslit.org/tips-tools/quiz-should-you-share-it/

19. Identifying Bogus Websites, Dark Money, Etc

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

20. Student Presentations

Resources

The topics covered in this course generate many books, articles, video and blogs. Much of this is dreadful, but some of it is really quite good. What follows are some websites, many of which link to excellent movies, articles and so on.

www.theskepticsguide.org
www.csicop.org
www.cs.man.ac.uk./skeptic
www.physics.smu.edu/pseudo
www.quackwatch.com
skepbitch.wordpress.com
www.junkscience.com
www.hcrc.org/sram/index.html
desmog.com

skepdic.com
www.skeptic.com
skepdic.com
www.pseudoscience.org
skepticblog.org
badscience.net
www.randi.org
www.skepticnews.com

Possible Topics

performance wrist bands, face creams, detox regimes, lie-detectors, truth serum, aromatherapy, subluxations, palm reading, ancient astronauts, full moon effect, ghosts, atlantis, Roswell, astrology, auras, psychoanalysis, telepathy, creationism, fortune-telling, remote viewing, the Secret, some sociobiology, some earthquake prediction, dowsing, magnetic therapy, reincarnation, cryptozoology, hypnotic age regression, clairvoyance, recovered memories, homeopathy, Ufo's, alien autopsies, naturopathy, channeling, most vitamin supplements, out-of-body experiences, telekinesis, …, but also consider "harder" cases.

Pre-historic flat earth human giant remains
in Bulgaria, covered up by Vatican

Sample Assignments (More Details in Class)

1. Problems for Popper

Describe a theory that is a problem for Popper's criterion of falsification

2. Headline Challenge! Causation or Correlation?

Find a title or even whole article that conveys a causal statement between two variables when in fact the study only shows a correlation. If possible suggest a more plausible causal story that would make the correlation hold instead of the one suggested.

3. Candle in the Dark Project

Find a website or even fake academic journal that appears to be neutral on some particular issue but really is not. Expose it to the light. e

4. Replication

Retake both the personality and food preferences surveys from class 1. What do you find? Are you consistent? Why do you think so (or not)?

5. Visit a Pharmacy

Go to a CVS or Walgreen's or Riteaid or… and look for a pseudoscientific item for sale. Take a picture of the item and it's ingredients. Research it at home. What does it claim to do? What does it suggest? Who are they targeting as customers? What harm is there in purchasing and using this product, if any?

6. Debunking Project

Choose something pseudoscientific to debunk. Follow the directions on the handout. Present your findings to the class, including a demo if possible. Write up your finding, including responses to the questions asked by your classmates.