

PHIL 26 Science, Society & Values: Good, Bad and Junk Science



Today more than ever before we are bombarded by information dressed in scientific garb. Most of the sources of this information want something from us, ranging from a purchase to a belief to a vote. Much hangs on our decisions, from small personal purchases (e.g., should we buy “performance” wristband?) to bigger personal choices (e.g., what medicine should I take?) to major public policy decisions (e.g., climate change, space station). Not all of the scientific-looking information is equal. The worst of it can be tremendously costly to individuals and society. AIDS pseudoscience, for instance, has cost untold thousands their lives; and most pseudoscience targets the most unfortunate among our society (i.e., the sick, uneducated, poor). With Oprah, Larry King, Hollywood stars, and mainstream news organizations and pharmacies peddling so much pseudoscience, how are we consumers of this information supposed to make informed rational judgments?

Giving you a start in helping you through these decisions is the primary goal of this course. We desire an answer to the “demarcation problem,” the problem of sorting science from pseudo-science. As consumers, citizens and believers, we face the practical demarcation problem every day of our lives. However, the demarcation problem is only the tip of the iceberg. Even if we had a solution to it, we would still be faced with the problem that all science isn't equal. Some of it is more deserving of trust than other parts. There are many types of evidence, ranging from observational studies to randomized control trials to meta-analyses. Are some of these inherently better than

others? Some science is more significant than other science. In addition, human beings are subject to influence from politics, money, and dreams of personal glory. 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. This course hopes to help you in this lifelong project by identifying some common techniques and pitfalls.

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Coordinates TuTh 3:30-4:50 in PCYNH 120

Office hrs Tues: 1:30-2:30 and by appt.

Reading

I've ordered two books for the course, both available at the UCSD Bookstore and via Amazon, etc.

- *Pseudoscience and Extraordinary Claims of the Paranormal: A Critical Thinker's Toolkit*, 2010, by Jonathan C. Smith
- *Voodoo Science: The Road From Foolishness to Fraud*, 2000, by Robert Park

Kindle versions of both books are also available. In addition, there will be many mandatory articles. If the link to the article is not provided on the syllabus, then it can be found on this class' e-library page. Some fun related very recent books – not mandatory – are *Bad Science: Quacks, Hacks and Big Pharma Flacks* by Ben Goodacre (only \$9.99!) and *Proofiness: The Dark Arts of Mathematical Deception* by Charles Seife.

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. 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, not 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. If you must open a computer or other electronic device in class, make sure it is only for note-taking or reading class assignments.

Grading

Homework: 20%

Midterm: 25%

Final: 25%

"Debunking" Project Report: 20%

"Debunking" Group Presentation: 10%

The project will be explained in a separate sheet.

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 papers will be accepted, but docked at the rate of 5% per day.

Tentative Schedule, Topics and Readings

1. **ESP, Remote Viewing, Atlantis, Detox Therapy, and All That: The High Costs of Pseudoscience**

Smith, chapters 1,2,3

Optional: E.g., "Science, sense, and nonsense about HIV in Africa"
<http://www.hpa.org.uk/cdph/issues/CDPHvol3/No2/editorials.pdf>

2. **The Philosophical Demarcation Problem: Popper and Astrology**

Smith, continued

Popper, "Conjectures and Refutations"
inf.fu-berlin.de/lehre/WS05/19616K/materials/PopperScience.pdf

Optional: Kelly, I. W. (1997). Modern astrology: A critique. *Psychological Reports* 81, 1035–1066
Derren Brown on astrology on Youtube.

3. **The Philosophical Demarcation Problem: Responses to Popper**

Lakatos, 1974, "Science and Pseudoscience" in Godfrey Vesey (Ed), *Philosophy in the Open*, Open University Press, 1974, pp. 96–102:
www.lse.ac.uk/collections/lakatos/scienceAndPseudoscienceTranscript.htm. Or hear Lakatos himself:
www.lse.ac.uk/collections/lakatos/scienceAndPseudoscience48.mp3

Thagard, Paul R. 1978. "Why Astrology is a Pseudoscience", in *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association*, Volume One: Contributed Papers, 1978, pp. 223–234.
Jstor.org.

Optional: Hansson, Sven Ove. "Science and Pseudo-Science", in Edward N. Zalta (Ed), *Stanford Encyclopedia of Philosophy*, 2008:
<http://plato.stanford.edu/entries/pseudo-science/>

4. **The Practical Demarcation Problem**

Resnick, "A Pragmatic Approach to the Demarcation Problem"
Studies In History and Philosophy of Science Part A, 31, 2000, 249-267.
Jstor.org

5. **Fallacies, Biases, Illusions and Parapsychology**

Smith, chapters 4, 6

Optional: Hyman, R. (1976–1977). “Cold reading”: How to convince strangers that you know all about them. *Zetetic*, 1, 18–37
www.skeptdic.com/Hyman_cold_reading.htm
Gilbert, D. T. (1991). How mental systems believe. *American Psychologist*, 46, 107–119. Jstor.org

6. **Fallacies, Biases, Illusions and Parapsychology**

Smith, chapters 7, 8, 10

Optional: viscog.beckman.illinois.edu/flashmovie/15.php
viscog.beckman.illinois.edu/flashmovie/12.php

7. **Aliens: Do They Exist, and if so, Why Are They Kidnapping Us?**

Nash, “Big Numbers and Induction in the Case for ETI”
Philosophy of Science, 1993. www.jstor.org/stable/188351

Optional: “The Extraordinary Tale of Red Rain, Comets and Extraterrestrials”:
www.technologyreview.com/blog/arxiv/25699/?ref=rss
BBC News, 2003: “Alien 'abductees' show real symptoms”
<http://casa.colorado.edu/~dduncan/pseudoscience/BBCAliens.pdf>

8. **Experiments and Placebos: Homeopathy**

Smith, chapters 9, 13, 14

Optional: www.bbc.co.uk/science/horizon/2002/homeopathy.shtml
<http://www.physics.smu.edu/pseudo/AlternativeMedicine/>

9. **Experiments and Causation: Homeopathy**

Smith, continued

Matute, Yarritu, & Vadillo, “Illusions of causality at the heart of pseudoscience” *British Journal of Psychology*. DOI: 10.1348/000712610X532210

We’ll draw many examples from the excellent: Mueller, J. (2007) “Correlations or Causation” jonathan.mueller.faculty.noctrl.edu/100/correlation_or_causation.htm

10. **Midterm**

Please remember to bring blue books

11. **Believing Where We Cannot Prove**

Kitcher, "Believing Where We Cannot Prove", from *Abusing Science*

Optional: Doppelt, "Science and Values" in *The Routledge companion to philosophy of science* By Stathis Psillos, Martin Curd

12. **Intelligent Design vs. Evolution**

Smith, chapter 15

Behe: www.counterbalance.net/perspevo/presmb-frame.html

Kitzmiller *et al.* vs. Dover Area School District *et al.* Memorandum

Opinion 20 Dec 2005 by Judge John E. Jones III:

<http://www.physics.smu.edu/pseudo/JohnEJones139pp.pdf>

Optional: Liu, Renyi and Howard Ochman. 2007. "Stepwise Formation of the Bacterial Flagellar System", in *Proceedings of the National Academy of Sciences*, Vol. 104, No. 17, April 2007, pp. 7116–7121.

<http://www.physics.smu.edu/pseudo/ID/>

13. **Intelligent Design vs. Evolution**

Lane, "Sight" in *Life Ascending: The Ten Great Inventions of Evolution*. WW Norton/Profile, 2009

Sober, 2007. "What Is Wrong With Intelligent Design?", in *The Quarterly Review of Biology*, Vol. 82, No. 1, March 2007, pp. 3–8. Jstor.org.

14. **Power Wires, Cell Phones, Vaccines...**

Park, chapter 7: "Currents of Fear"

Resnik, "Is the Precautionary Principle Unscientific?" *Studies in History and Philosophy of Science Part C*, 2003. Jstor.org

15. **Insignificant Science? The Space Station?**

Park, chapter 4.

16. **Junk Science: The Case of Second-Hand Smoking**

Oreskes and Conway, "What's Bad Science? Who Decides? The Fight Over Second-Hand Smoke, in *Merchants of Doubt*, 136-168.

Optional: www.defending-science.org/upload/Doubt-is-their-Product.pdf

Michaels and Monforton, "Manufacturing Uncertainty: Contested Science and the Protection of the Public's Health and Environment"
ajph.aphapublications.org/cgi/content/full/95/S1/S39
Freedman, David, "The Streetlight Effect", *Discover*
discover.coverleaf.com/discovermagazine/20100708?pg=58#pg56

17. **Junk Science: Worries about Big Pharma**

Michaels, "This Country Has a Drug Problem" (143-160) in *Doubt is Their Product*.

Optional: Holtz, "Untold numbers of drug clinical trial results go unpublished", *Wall Street Journal* 2008. www.greenchange.org/article.php?id=3666
Beatrice Golomb: www.youtube.com/watch?v=3_Oc2xElvL4
Worrall, John (2010) Evidence: philosophy of science meets medicine. *Journal of evaluation in clinical practice*, 16 (2). pp. 356-362.
Smith & Pell (2003). Parachute Use to Prevent Death and Major Trauma Related to Gravitational Challenge: Systematic Review of Randomised Controlled Trials. *BMJ* 327 (7429):1459--61. www.bmj.com/content/327/7429/1459.abstract

18. **"Too Good to be True": Perpetual Mobiles and Cold Fusion**

Park, chapters 5, 6.

19. **"Too Good to be True" (but True!): Superconductivity**

Park, continued

20. **Debunking 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/
skepdic.com/
www.csicop.org
www.skeptic.com
www.cs.man.ac.uk./skeptic
skepdic.com
physics.syr.edu/courses/modules/PSEUDO/pseudo_main.html
www.physics.smu.edu/pseudo/

www.pseudoscience.org
www.junkscience.com www.randi.org
www.skepticnews.com www.hcrc.org/sram/index.html
www.quackwatch.com
skepticblog.org/author/dunning
skepbitch.wordpress.com
badscience.net

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, reincarnation, cryptozoology, hypnotic age regression, clairvoyance, recovered memories, homeopathy, Ufo's, alien autopsies, channeling, most vitamin supplements, out-of-body experiences, telekinesis, ..., but also consider "harder" cases.

Ignorance more frequently begets confidence than does knowledge: it is those who know little, and not those who know much, who so positively assert that this or that problem will never be solved by science.

-- Darwin