

Chem 199: Weird Science

Syllabus for Fall 2004

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Class Times: Tues, Thur: 2:00-3:20 PM

Classroom: 202 Cascade Hall

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Introduction:

Science is a powerful tool to understand and explain the natural world we all live in. Because of its apparent success in so many areas of our everyday lives, there are many instances in which individuals or groups claim that certain strongly or emotionally held beliefs are “scientific” or are supported by “scientific” studies. Even some scientists may make unwarranted claims of scientific “truth” (e.g., “cold fusion”). How can the public, often without specialized scientific training, distinguish between scientific and pseudo-scientific claims?

This course will attempt to teach how to separate reasonable and unreasonable claims by learning how science tackles difficult problems. The key is to be skeptical, but not too skeptical.

Course Scope and Goals:

This course is designed to provide students with some of the skills necessary to critically evaluate “scientifically based” claims, particularly those involving fringe science, the paranormal, and other unusual claims. Extraordinary claims require extraordinary evidence. We will try to understand the way in which science and pseudo-science both differ and are related. Because science is such an ill-defined methodology, it is often easy to misunderstand how scientists actually go about their jobs and reach the conclusions that they reach. Therefore we will attempt to learn something about how science tackles difficult problems and from this we hope to understand not only why it is impossible to give a concise definition of either science or pseudo-science.

We will examine human thought processes, paying particular attention to their fallibility, reliance on intuition, irrationality and the desire to hold beliefs however untenable as long as they are comforting. We will also learn about the scientific methods and techniques that can compensate for these limitations in human thought. Emphasis will be placed on mastering the basics of evidence based argument, experimental design and investigation that can be applied to a vast number of phenomena. To help master these techniques and hone critical thinking skills, we will read about actual investigations of unusual phenomena, both historical and current.

The topics that we will examine together may include: ESP, witchcraft, alien abduction, astrology, alternative medicine, dowsing, superstition, the healing powers of magnets, and false/recovered memory, some of which profess to be objective and scientifically observable, and try to explain the psychology behind the clearly human need to believe. The course will culminate in the presentation of individual projects on particular paranormal or unusual phenomena and a short discussion period. A final short paper summarizing the individual projects will constitute the final exam.

Course Format:

This course is seminar based, where student participation is an essential ingredient to mastering the topics under discussion. In addition there will be regular (ten in total) written assignments based on the reading material as well as a few videos and possibly a guest speaker or two. Therefore, the quality of the course will be heavily dependent upon student preparation and participation in class discussions. Students may be asked to read aloud to the class some assigned writings. On some days, a pair of students may be in charge of briefly summarizing the readings on a particular topic, and then facilitating discussion on that topic.

Some assignments are not in the required textbooks but are on-line as electronic reserves. Go to:

http://libweb.uoregon.edu/acs_svc/reserve-index.html

and enter CH199 as the course and use the supplied login and password to access the assigned reading.

Part I: Basics of the Scientific Method and how Science looks at the Paranormal

Midterm (question and answer exam)

Part II: Investigation, Presentation and Discussion of Pseudo-scientific Claims

Final (5 page essay- summary of a selected presentation and discussion)

Required Textbooks:

- James Randi's 'Flim-Flam', 1982, ISBN 0-87975-198-3
- Michael Shermer's "Why People Believe Weird Things", 1997, ISBN 0-7167-3387-0
- Carl Sagan's "The Demon Haunted World", 1997, ISBN 0-345-40946-9

Additional Selected Readings:

- "Newton Gets It Completely Wrong", Chapter 1 from Brian Silver's "The Ascent of Science", 1998, ISBN 0-19-511699-2
- "The Therapeutic Assault", Chapter 6 from Wendy Kaminer's "Sleeping With Extra-terrestrials", 1999, ISBN 0-679-44243-X

- “Good and Bad Reasons for Believing”, Chapter 7.1 from Richard Dawkin’s “The Devil’s Chaplain”, 2003, ISBN 0-618-33540-4
- Selected articles from “Skeptical Inquirer” magazine as assigned

Videos:

- PBS’s NOVA, Scientific American Frontiers and Frontline series

Knowledge Expectations (from Cloyd Hyten, UNT):

- What sciences can and can’t prove about the paranormal and other beliefs
- 20 ways that para-normalists fool naïve observers or themselves (Randi)
- What is strong scientific evidence and what is weak.
- What is the “placebo effect” and why is it controversial
- What is blind and double-blind testing and why are they valuable
- What constitutes a scientific explanation
- The self-correcting nature of science
- The role of uncertainty in science
- The difference between science and pseudo-science
- The difference between rationalism and dogmatism
- 3 problems with scientific thinking (e.g., theory influencing observation)
- 12 problems with pseudoscientific thinking (e.g. anecdotal evidence)
- 7 logical problems (e.g., ad hominem and ad ignoratiam arguments)
- 3 psychological problems (e.g., the need for certainty).

Policies:

Academic Honesty: Some of the work in this class will be of a collaborative nature. However, you are expected to write the reports and papers entirely on your own. Don’t even think about trying to download from the Internet and turn in a single sentence that is not your own. Information on the Internet is not “public domain”. Someone wrote it (maybe even someone named “anonymous”) and **all work from any source not your own must be attributed**. You are expected to be familiar with and abide by the University’s guidelines on plagiarism. Cases of academic dishonesty will result in a grade of F for this class and possible further action by the university.

See: <http://libweb.uoregon.edu/guides/plagiarism/students/> for more information.

Late Work, Absences, and Make-Ups:

Because this class depends to a large extent of class participation in discussion and exploration of complex issues, absences are impossible to make up and are especially detrimental to learning. You will be allowed to miss one class. One additional excused absence will be allowed. However, if you miss more than 2 classes for any reason, you will not receive credit for this course.

Late assignments will lose points. If the assignment is handed in the day due but not at the beginning of class (or at the assigned time), 10% of the points will be deducted from the total earned. If the assignment is handed in the next day, 20% of the points will be deducted. After one day, no late assignments will be accepted. If exceptional circumstances make it difficult for you to complete an assignment on time, notify me well in advance, and I may grant you an extension, at my discretion.

Assignments

You are expected to be prepared for each lecture and discussion by reading the assigned material and completing all assigned writing before each class. One of the main goals of this course is to improve your critical writing skills which are essential to a successful college career. All work **MUST** be typed (double spaced) and submitted as a hard copy or as a Word, Text or PDF file via email attachment. I will not accept handwritten material for the simple reason that the process of critical writing requires several iterations of re-reading, editing and re-writing. This is impractical with handwritten assignments.

If you do not have a computer, please see me. There are computer facilities throughout the campus and library, and if worse comes to worse, I have a computer in my lab that is available for your use.

It is expected that all students have formal college level essay writing skills. The university does not offer classes in grammar, spelling and punctuation for this reason. In addition, all students are expected to be able to write clearly, concisely using complete sentences, with well connected statements and evidence supported ideas. If you cannot effectively express and communicate your ideas in writing you will be at a severe disadvantage. However, there are consultation and tutoring services offered on-campus. If you think that your writing skills are in need of improvement, please contact Academic Learning Services at:

<http://als.uoregon.edu/services/services.html>

or call (541) 346-3226.

Mid Term Exam

A midterm will test your mastery of the concepts presented in the first unit, these ideas represent the foundation of the course and are essential for proper design and presentation of the topics in the second unit.

Class Readings of Assigned Writings:

You will be asked occasionally to read aloud the work of another classmate. You will not reveal the author of the work, unless you have permission from the author. The reading should be done in a measured and audible manner with an effort to present the information as effectively as possible. You may be asked to pose a number of questions to the class designed to facilitate discussion by the class as a whole.

Presentation of Individual Projects:

Presentations and discussions will begin in Unit 2. A list of topics will be circulated so that you can list your preferences for the topics. Please feel free to discuss your ideas and/or choices with me on topics of presentation and discussion. You may want to have you and your partner present pro and con sides of the topic.

You will present your project (the research question or issue, your hypothesis, your research into the subject and you will co-lead a discussion of the topic with special attention to politeness, inclusiveness and etiquette) to the class. Each student's presentation will last approximately 8-12 minutes. *Guidelines for content and format of the presentations will be distributed as the project unit begins*

Final Paper:

You are required to write up the presentation of your individual project as a formal paper of 5-8 pages using standard academic writing styles and formats. This is not meant to be a mere transcription of your verbal presentation, but rather a serious academic paper that discusses the subject from both believer and skeptic viewpoints. It is essential that the paper examine the validity of the arguments presented by both sides with special attention to the tools provided for

critical thinking that we will have covered during the course. *Guidelines for the paper will be distributed.*

Grading:

Your semester grade will be based on 600 total points from the following sources:

Class participation: 100

Reading Summaries (10 x 10 points each): 100

Mid Term Exam: 100 points

Team Project Presentation: 100 to each team member

Final Paper: 200

TOTAL: 600 points

Grades will be assigned as follows: 90%-100% = A range; 80%-89% = B range; 70%-79% = C range; 60%-69% = D range; below 60% = F. No plus or minus grades will be given.

Required Texts:

- Shermer, M. (1997). *Why people believe weird things*. New York: Freeman and Co.
- Sagan, C. (1995b). *The demon-haunted world: Science as a candle in the dark*. New York: Random House.
- Randi, J. (1982). *Flim-Flam!: Psychics, ESP, unicorns, and other delusions*. Amherst, NY: Prometheus Books.

Selected Course Readings:

(CHANGES IN THE READINGS MAY BE MADE DURING THE SEMESTER)

- “Newton Gets It Completely Wrong”, (Chapter 1) from *The Ascent of Science* by Brian Silver, New York, Oxford University Press. 1998, ISBN 0-19-511699-2
- “The Therapeutic Assault”, (Chapter 6) from “*Sleeping With Extra-terrestrials*” by Wendy Kaminer, New York, Vintage Books, Division of Random House. 2000, ISBN 0-679-75886-0
- “Good and Bad Reasons for Believing”, Chapter 7.1 from Richard Dawkin’s “*The Devil’s Chaplain*”, 2003, ISBN 0-618-33540-4
- Selected articles from “*Skeptical Inquirer*” magazine

Other Readings:

- Anderson, R. D. (1970). The history of witchcraft: A review of some psychiatric comments. *American Journal of Psychiatry*, 126 (12), 1727-1735.
- Blackmore, S. (1992, Summer). Psychic experiences: Psychic illusions. *Skeptical Inquirer*, 159-165.
- Blackmore, S. (1998, May/June). Abduction by aliens or sleep paralysis? *Skeptical Inquirer*, 23-28.
- Carr, J. J. (1992). *The art of science: A practical guide to experiments, observations, and handling data*. San Diego, CA: HighText Publications.
- Darnton, R. (1968). *Mesmerism and the end of the Enlightenment in France* (Chapters 1 & 2). Cambridge, MA: Harvard University Press.
- Doyle, A. C. (1926). *The history of spiritualism* (pp.). New York: George H. Doran Company.
- Ekman, P. (1992). The polygraph as lie catcher. In P. Ekman, *Telling lies* (Chapter 7), New York: W. W. Norton & Co.
- Ertel, S. (1992, Winter). Update on the “Mars effect.” *Skeptical Inquirer*, 150-161. (read also responses to the article)
- Feather, S. R., & Rhine, L. E. (1968). PK experiments with same and different targets. *The Journal of Parapsychology*, 33(3),213-227
- Frazier, K. (1998). On Coincidences. In K. Frazier, *Encounters with the paranormal: Science, knowledge, and belief* (Chapter 5). Amherst, NY: Prometheus Books.
- Frazier, K. (1998). Fooling some people all of the time. In K. Frazier, *Encounters with the paranormal: Science, knowledge, and belief* (Chapter 6). Amherst, NY: Prometheus Books.
- Frazier, K. (1998). The moon is acquitted of murder in Cleveland. In K. Frazier, *Encounters with the paranormal: Science, knowledge, and belief* (Chapter 25). Amherst, NY: Prometheus Books.
- French, C. C., Fowler, M., McCarthy, K., & Peers, D. (1991, Winter). Belief in astrology: A test of the Barnum effect. *Skeptical Inquirer*, 166-172.
- Furnham, A. (1998, Fall). Write and wrong: The validity of graphological analysis. *Skeptical Inquirer*, 64-69.
- Gilovich, T. (1991). *How we know what isn’t so: The fallibility of human reasoning in everyday life*. New York: The Free Press.
- Gardner, R. (1996). *The truth about graphology*. St. Paul, MN: Llewellyn Publications.
- Groth-Marnat, G., & Pegden, J. (1998). Personality correlates of paranormal belief: Locus of control and sensation seeking. *Social Behavior and Personality*, 26 (3), 291-296.
- Hines, T. (1998). The nature of pseudoscience. In T. Hines, *Pseudoscience and the paranormal: A critical examination of the evidence* (Chapter 1). Buffalo, NY: Prometheus Books.

- Hines, T. (1998). Astrology, the lunar effect, and biorhythms. In T. Hines, *Pseudoscience and the paranormal: A critical examination of the evidence* (Chapter 6). Buffalo, NY: Prometheus Books.
- Honorton, C. (1993, June). Rhetoric over substance: The impoverished state of skepticism. *Journal of Parapsychology*, 57, 191-214.
- Kelly, I. W., Rotton, J., & Culver, J. (1985, Winter). The moon was full and nothing happened. *Skeptical Inquirer*, 129-133.
- Kruger, J., Savitsky, K., & Gilovich, T. (1999, March/April). Superstition and the regression effect. *Skeptical Inquirer*, 23, 24-29.
- Lett, J. (1990, Winter). A field guide to critical thinking. *Skeptical Inquirer*, 14, 31-39.
- Loftus, E. (1997, September). Creating false memories. *Scientific American*, 71-75.
- Lykken, D. T. (1984). Polygraphic interrogation. *Nature*, 307, 681-684.
- Lynn, S. J., Lock, T. G., Myers, B., & Payne, D. (1997). Recalling the unrecalable: Should hypnosis be used to recover memories in psychotherapy? *Current Directions in Psychological Science*, 6, 79-83.
- Milton, J., & Wiseman, R. (1999). Does Psi exist? Lack of replication of an anomalous process of information transfer. *Psychological Bulletin*, 125, 387-391.
- Moore, T. E. (1996, November/December). Scientific consensus and expert testimony: Lessons from the Judas Priest trial. *Skeptical Inquirer*, 32-38.
- Nash, M. (1987). What, if anything, is regressed about hypnotic age regression? *Psychological Bulletin*, 102, 42-52.
- Neinhuys, J. W. (1997, November/December). The Mars effect in retrospect. *Skeptical Inquirer*, 24-29.
- Park, M. A. (1982, Winter). Palmistry: Science or hand jive? *Skeptical Inquirer*, 198-208.
- Piper, A. (1993). "Truth serum" and "recovered memories" of sexual abuse: A review of the evidence. *The Journal of Psychiatry and Law*, 21, 447-471.
- Rhine, J. B. (1974). Telepathy and other untestable hypotheses. *The Journal of Parapsychology*, 38 (2), 137-153.
- Rhine, J. B. (1972). Parapsychology and man. *The Journal of Parapsychology*, 36 (2), 101-121.
- Rhine, J. B. (1969). Psi-missing re-examined. *The Journal of Parapsychology*, 33 (1), 1-38.
- Roberts, M. J., & Seager, P. B. (1999). Predicting belief in paranormal phenomena: A comparison of conditional and probabilistic reasoning. *Applied Cognitive Psychology*, 13, 443-450.
- Rowe, W. F. (1993, Winter). Psychic detectives: A critical examination. *Skeptical Inquirer*, 159-165.
- Sagan, C. (1995a). The most precious thing. In C. Sagan, *The demon-haunted world: Science as a candle in the dark* (Chapter 1). New York: Random House.
- Stanovich, K. (1998). *How to think straight about psychology* (5th edition). New York: Harper/Collins.
- Spanos, N. P. (1987). Past-life hypnotic regression: A critical view. *Skeptical Inquirer*, 78-84.
- Stanovich, K. E. (1999). Has human irrationality been empirically demonstrated? In K. E. Stanovich, *Who is rational?* (Chapter 8). Mahwah, NJ: Lawrence Erlbaum Associates.
- Stewart, J. V. (1997). What's your sign? Astrology: What's really in the stars. *Skeptic*, 5, 68-72.
- Taylor, J. M. (1908). *The witchcraft delusion in colonial Connecticut, 1647-1697*. New York: The Grafton Press (only pp. 10-22; 35-44).
- Trinkhaus, J. W., & Booke, A. L. (1982). Biorhythms: Another look. *Psychological Reports*, 50 (2), 396-398.
- Vitulli, W. F., & Luper, S. L. (1998). Sex difference in paranormal beliefs among undergraduate college students. *Perceptual and Motor Skills*, 87, 475-483.