

Physics 3333 / CFB 3333 - The Scientific Method

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Physics 3333 / CFB 3333

The Scientific Method - Critical and Creative Thinking

(Debunking Pseudoscience)

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QUICK LINKS

[SYLLABUS](#) - [LEARNING OUTCOMES](#) - [ATTENDANCE POLICY](#) - [DISABILITIES AND EXCUSED ABSENCES](#)

"Be very, very careful what you put into that head, because you will never, ever get it out."
--Thomas Cardinal Wolsey (c.1475-1530)

"Science is bound, by the everlasting vow of honour, to face fearlessly every problem which can be fairly presented to it."
--Lord Kelvin (1824-1907)

"What is wanted is not the will to believe, but the will to find out, which is the exact opposite."
--attributed to Bertrand Russell (1872-1970)

PHYS 3333 satisfies a Physics elective requirement.

CFB 3333 satisfies a General Education Curriculum **Cultural Formations** requirement. Students can appeal for honors or diversity credit at the General Education Office after making arrangements with the lecturers.

Description:

This course will provide you with an understanding of the scientific method sufficient to detect pseudoscience in its many guises: paranormal phenomena, free-energy devices, alternative medicine, intelligent design creationism, and many others. You will learn to think critically and to question outlandish claims, hype, and outright BS.

Your writing will improve. You will be able to distinguish credible sources of information from nonsense; you will become an intelligent consumer of information. Expect to do a lot of reading, writing, and, most of all, thinking.

Goals/Objectives/Learning Outcomes:

Lecture Times and Place: MWF 11:00-11:50am in room 153 Fondren Science

Lecturers: [Professor Stephen Sekula](#) and Professor John Cotton

Office Hours:

- Sekula: Tuesday and Thursday afternoons from 3:00-4:00pm in The Varsity (Hughes-Trigg, Lower Level)
- Cotton: Wednesday and Friday after lecture and 2:00-3:00pm in room 7 Fondren Science (lower floor)

Contact:

- Call or leave a message at
 - ◆ Sekula: (214)768-7832
 - ◆ Cotton: (214)768-4096
- Leave a note in the Physics Department Office - 102 Fondren Science, or
- send email to pseudo@physics.smu.edu

Course Work:

- Weekly reading, reading quizzes, discussion, [homework](#), in-class writing assignments
- Two 3-page [book reviews](#) from the [Auxiliary Reading](#) list (feel free to suggest other titles subject to instructor approval)
- One 7-page (minimum) [research paper](#)
- One 15-page (minimum) [research paper](#)
One paper is due at midsemester; this paper can be rewritten for a higher grade. The other paper is due at the end of the semester.
- Physics 3333 and Honors CFB 3333 students will present orally the last week of class
- Written [final examination](#)

Check to see if we received your papers, book reviews, or homework -- it is YOUR responsibility to check!

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The book reviews and research papers must be turned in electronically. We will not accept paper copies. Mail your assignment to pseudo@physics.smu.edu or turn in a CD. Accepted digital formats: ASCII (plain) text, PDF, RTF, or MS Word format (.doc not .docx): double-spaced, 12-point type, Times New Roman (nonbold) font, 1-inch margins. We can not read WordPerfect or Macintosh files.

Required Course Texts:

- *The Demon-Haunted World : Science As a Candle in the Dark* by Carl Sagan
- *How to Think About Weird Things : Critical Thinking for a New Age* by Theodore Schick and Lewis Vaughn (6th edition)
- *Asking the Right Questions* by M. Neil Browne and Stuart M. Keeley (9th edition). If you got a 10th edition from the bookstore, look at [this index comparison](#).

Syllabus -- Includes lecture notes and assignments

Homework Assignments

Suggested Auxiliary Reading

Grading, Extra Credit, Incompletes

Attendance Policy, Classroom Environment

Grade Summary - All the individual student grades arranged by four-digit code number

A Note on PLAGIARISM -- Very important!

Notes on Writing Research Papers

Suggested Research Paper Topics

Excellent Past Student Research Papers (password protected)

Criteria for a Successful Experiment

The Baloney Detection Collection

Complete list of subjects available

Problems of Fuzzy Thinking

Relevant Web Sites

Other Resources -- Video, periodicals, etc.

Videos

Previous Incarnations of this Course -- with lecture notes

Seminars and Presentations

Students with disabilities, medically excused absences, absences in general

Anonymous Feedback

Things you should already know, but...

University Holidays

Official University Calendar

Disclaimer

Fighting ignorance since 2003 - *pace* Cecil Adams (he's not a real person, anyway)



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The Scientific Method

Syllabus - Spring 2012

Items of interest:

We'll fill in more news items as they appear.

- [Tricks of the Psychic Trade](#) (Psychology Today website)
- [Naomi Oreskes, "The Verdict is in on Climate Change."](#) LA Times, Jan. 22, 2012. An interesting comparison and contrast piece between public attitudes toward climate science and public attitudes toward innocence/guilt in the American Justice System.
- Peter Gleick on "Climate Change Misconceptions" Part 1: <http://is.gd/kg6hIV> and Part 2: <http://is.gd/ozu5cT> (1/19/2012)
- [Researchers report evolving a multicellular organism from autonomous single-celled organisms in just 2 months.](#) (Ars Technica, 1/17/2012)
- [Climate change skepticism seeps into science classrooms](#) (L.A. Times)
- [Killer flu doctors: US censorship is a danger to science](#) (The Independent)
- [Richard Dawkins celebrates a victory over creationists](#) (The Guardian)
- 2012 Challenges to Public School Science Education
 - ◆ [Indiana: This bill was shelved by the Indiana House of Representatives on Feb. 14. The strategy in this bill called for "Creation Science" to be taught in school. There is already a Supreme Court \("\[Edwards v. Aguillard\]\(#\)"\) ruling that found that "Creation Science" is a re-packaging of religion and therefore not science.; \[Senate Bill 89\]\(#\); \[Creationist Legislation in Indiana\]\(#\) \(National Center for Science Education\); \[Creationist bill in Indiana shelved\]\(#\) \(NCSE\);](#)
 - ◆ [Missouri: Note: the strategy pursued here is to call for "equal time" for a scientific theory and an unproven hypothesis.; "\[HOUSE BILL NO. 1227\]\(#\)"; "\[HOUSE BILL NO. 1276\]\(#\)"; "\[Intelligent design\]\(#\)" bill in Missouri](#) (National Center for Science Education); [Update from Missouri](#) (National Center for Science Education);
 - ◆ [New Hampshire: Note: the strategy pursued here is based on a misunderstanding of the word "theory," where the legislators try to equate "theory" with "hypothesis." Bill 1457 demonstrates a misunderstanding of science and the scientific method.; \[HB 1148\]\(#\); \[HB 1457\]\(#\); \[Antievolution legislation in New Hampshire\]\(#\) \(National Center for Science Education\); \[Bills seek to dilute the teaching of evolution in public schools\]\(#\) \(Nashua Telegraph\) \[Monitoring antievolution bills in New Hampshire\]\(#\) \(National Center for Science Education\); \[New Hampshire legislature dismisses anti-evolution bills.\]\(#\) \(NCSE\);](#)
 - ◆ [Oklahoma: This one is extremely vague, except that it goes out of its way to state that the bill should not be construed as an attempt to promote any one set of religious doctrine or belief. The tactic here is to imply that students are not being taught to think critically, but only as concerns evolution, climate change, human cloning, and the origin of life; the bill then suggests this is a crisis that needs to be fixed by passing a bill to support critical thinking. It's a barely veiled "equal time for opposing ideas" bill. It's also very vague about what "supplemental material" could be used to counter a mainstream science textbook.; \[SB 1742\]\(#\); \[Oklahoma GOP Introduces Bill That Attacks Evolution And Climate Change\]\(#\);](#)
- [2011 Psychic Predictions . . . Revisited \(1/8/12\)](#)
- [Deception on the Burzynski Clinic Website?](#)

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[Older items](#)

[ALL AVAILABLE LECTURE VIDEO OR AUDIO]

DATE	TOPIC	READING, QUIZZES AND HOMEWORK
Jan 18 W Lecture # 1	Introduction ; [SLIDES (printable)]	Start reading Sagan
20 F Lecture # 2	The Scientific Method ; [SLIDES (printable)]; Continue reading	Survey due in class

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Sagan		
23 M Lecture # 3	<u>The Scientific Method</u> continued; Magic; [SLIDES (printable)]	Quiz on preface, chapters 1 and 2 of Sagan
25 W Lecture # 4	<u>Induction and Deduction</u> ; [SLIDES (printable)]	Quiz on chapters 3 and 4 of Sagan
27 F Lecture # 5	<u>DNA, Art Fraud, Shroud of Turin</u> ; [SLIDES (printable)]	<u>Homework #1</u> due by 11:00am
30 M Lecture # 6	<u>Shroud of Turin</u> ; [SLIDES (printable)]	Quiz on chapters 5 and 6 of Sagan
Feb 1 W Lecture # 7	<u>Observation and Perception</u> ; [SLIDES (printable)]	Quiz on chapters 7 and 8 of Sagan
3 F Lecture # 8	<u>UFOs and Roswell</u> ; [SLIDES (printable)]	<u>Homework #2</u> due by 11:00am
6 M Lecture # 9	<u>Guest Lecture: Pat Van Zandt, Central University Libraries</u> ; ;Quiz on chapters 9 and 10 of Sagan	
8 W Lecture #10	<u>UFOs and Roswell</u> continued; [SLIDES (printable)]	Quiz on chapters 11 and 12 of Sagan
10 F Lecture #11	<u>Bermuda Triangle</u> ; [SLIDES (printable)]	Midterm paper's title, abstract, outline, and sources due by 11:00am
13 M Lecture #12	<u>What is Evidence?</u> ; [SLIDES (printable)]	Quiz on preface, chapters 1 and 2 of Browne & Keeley
15 W Lecture #13	<u>Eyewitness Testimony</u> ; [SLIDES (printable)]	Quiz on chapters 3 and 4 of Browne & Keeley
17 F Lecture #14	<u>Eyewitness Testimony</u> continued; [SLIDES (printable)]	<u>3-page Book review #1</u> due by 11:00am
20 M Lecture #15	<u>Eyewitness Testimony</u> continued [SLIDES (printable)]	Quiz on chapters 5 and 6 of Browne & Keeley
22 W Lecture #16	<u>Astrology</u> [SLIDES (printable)]	Quiz on chapter 7 of Browne & Keeley
24 F Lecture #17	<u>Astrology (Part 2)</u> [SLIDES (printable)]	<u>Homework #3</u> due by 11:00am
27 M Lecture #18	<u>Psychics</u> (Part 1)	Quiz on chapter 8 of Browne & Keeley
29 W Lecture #19	<u>Psychics</u> (Part 2) and <u>Cold Reading/Speaking to the Dead (Part 1)</u> [SLIDES (printable)]	Quiz on chapter 9 of Browne & Keeley
Mar 2 F Lecture #20	<u>Psychics</u> (Part 3) and <u>Cold Reading/Speaking to the Dead (Part 2)</u>	<u>Homework #4</u> due by 11:00am
5 M Lecture #21	<u>Experiment Design</u> [SLIDES (printable)]	Quiz on chapter 10 of Browne & Keeley
7 W Lecture #22	<u>Experiment Design</u> [SLIDES (printable)]	Quiz on chapter 11 of Browne & Keeley
9 F Lecture #23	Demonstrations of famous speakers to the dead	<u>Midterm paper</u> due by 11:00am
12 M SPRING BREAK		
14 W SPRING BREAK		
16 F SPRING BREAK		
19 M Lecture #24	<u>Probability</u> [SLIDES (printable)]	Quiz on chapter 12 of Browne & Keeley
21 W Lecture #25	<u>Probability</u> [SLIDES (printable)]	Quiz on <u>They See Dead People, Or Do They?</u>
23 F Lecture #26	<u>How to Lie with Statistics</u> [SLIDES (printable)]	

Items of interest:

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		<u>Homework #5</u> due by 11:00am
26 M	Lecture #27	<u>Propaganda</u> Quiz on chapter 13 of Browne & Keeley
28 W	Lecture #28	<u>Propaganda</u> Quiz on chapter 14 of Browne & Keeley
30 F	Lecture #29	<u>Propaganda</u> Final paper's title, abstract, outline, and sources due by 11:00am
Apr 2 M	Lecture #30	<u>Modern Scams [SLIDES (printable)]</u> Quiz on chapters 13 and 14 of Sagan
4 W	Lecture #31	<u>Modern Scams [SLIDES (printable)]</u> <u>3-page book review #2</u> due by 11:00am
6 F	UNIVERSITY HOLIDAY	
9 M	Lecture #32	<u>Hoaxes (PART 1);</u> Quiz on chapters 15 and 16 of Sagan
11 W	Lecture #33	<u>Hoaxes (PART 2) [SLIDES (printable)]</u> and <u>Preparatory Lecture Ahead of Friday Guest Lecture on Intelligent Design/Creationism;</u> Quiz on foreword through chapter 2 of Schick and Vaughn
13 F	Lecture #34	<u>Intelligent Design is not Science</u> - Guest lecture by Professor John Wise (SMU Biology) Quiz on chapter 3 of Schick and Vaughn
16 M	Lecture #35	<u>Intelligent Design/Creationism</u> Continued - Guest Lecture by Prof. Randy Scalise (SMU Physics) Quiz on chapter 4 of Schick and Vaughn
18 W	Lecture #36	Intelligent Design/Creationism and Science Education - Guest Lecture by Professor Ron Wetherington (SMU Anthropology) Quiz on chapter 5 of Schick and Vaughn
20 F	Lecture #37	The Earth is Flat - Guest Lecture by Professor Fred Olness (SMU Physics) Midterm rewrites due by 11:00am
23 M	Lecture #38	<u>Dr. Snow and Cholera; Barry Marshall and Ulcers;</u> Quiz on chapter 6 of Schick and Vaughn
25 W	Lecture #39	Radiation MADNESS! <u>[SLIDES (printable)]</u> Quiz on chapter 7 of Schick and Vaughn
27 F	Lecture #40	<u>2012</u> - Guest Lecture by Mr. Farley Ferrante Final paper due by 11:00am
30 M	Lecture #41	<u>Homeopathy and any other fake medicine we can fit in. [SLIDES (printable)]</u> <u>Homework #6</u> due by 11:00am
May 1 T	Lecture #42	(Some of) The World's Wackiest <u>Hoaxes</u> ; Follows a Friday class schedule Quiz on chapter 8 of Schick and Vaughn
4 F	Final Examination	08:00-11:00am in 153 Fondren Science

Lecture Topics:

2012; Abstinence Only; AIDS Denial; Alternative Medicine; Assumptions; Astrology; Bermuda Triangle; Cannibalism; Cold Reading; Talking to the Dead; Creationism; Death Penalty; DNA, Art Fraud; ESP; Second-hand Smoke (ETS); Experiment Design; What is Evidence?; Eyewitness Testimony; Faith Healing; Flat Earth; Global Warming; Hoaxes; Intelligent Design Creationism; Induction and Deduction; Introduction; Law of Unintended Consequences; How to Lie with Statistics; Trofim Lysenko; Modern Art; Observation and Perception; Patents; Peak Oil; Polls; Probability; Propaganda; Recognizing Pseudoscience; Psychics; Conceptions about Risk; Modern Scams; Scams, Frauds, and ID Theft; The Scientific Method; Science and Religion; Shroud of Turin; Skeletons in the Physics Closet; Dr. Snow and Cholera; Barry Marshall and Ulcers; Searching for the Star; Stellar Evolution; Student Presentations; Threshold Phenomena; UFOs; Vaccines do not Cause

Lecture Topics:

Autism: They See Dead People, Or Do They?



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