

# STS-UY.2554 Science and Pseudoscience

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M/W 10:30am-12:20pm

## I. Description

This is a survey of popular "pseudoscientific" claims with emphasis on such issues in the philosophy of science as demarcation, evidential warrant, scientific progress, rhetoric of science, science and public policy, and fallacies of reasoning. The class format will consist primarily of student presentations on topics of their choice. In the past, topics covered have included UFO sightings and alien abductions, the Nemesis theory of dinosaur extinctions, astrology, intelligent design, psychic phenomena, theories of intelligence, alternative medicines, climate change, cold fusion, and public health controversies (i.e., vaccines, genetically modified food, AIDS denialists, vaping, etc.). Student input in determining topics to cover is heavily emphasized.

## II. Objectives

### HuSS (Humanities and Social Sciences) General Education Objectives:

Think critically, creatively and independently; demonstrate information literacy; demonstrate skills in inquiry and analysis; demonstrate effective oral communication skills; demonstrate effective writing skills; bring the perspectives of HuSS to bear on technical discourse; demonstrate ethical reasoning.

### STS (Science, Technology and Society) Cluster Objectives:

- Demonstrate a basic understanding of the following:
  - How sci and tech shape society (in historical, philosophical, sociological, cultural, and technical ways).
  - How social processes frame sci and tech enterprises, including theory construction, invention, and innovation
  - The relation between the content of sci/tech knowledge, and the social and intellectual context in which it is created.
- Demonstrate technical proficiency in a field in the natural sciences or engineering.
- Demonstrate ability to critically analyze and communicate complex issues involving the interactions among sci, tech, and society.

## III. Required Texts

**A. Texts.** Over the course of the semester we will be reading excerpts from the following texts. The first 3 will need to be purchased. The remaining are available online.

### At Bookstore:

1. Berra, T. (1990) *Evolution and the Myth of Creationism*, Stanford.
2. Gordin, Michael (2013) *The Pseudoscience Wars*, Chicago.
3. Raup, D. (1999) *The Nemesis Affair*, Norton.

### Online (at NYU Classes or otherwise indicated):

4. Courtillot, V. (2002) *Evolutionary Catastrophes*, CUP.
5. Fancher, R. (1985) *The Intelligence Men: Makers of the IQ Controversy*, Norton.
6. Harker, David (2015) *Creating Scientific Controversies: Uncertainty and Bias in Science and Society*, CUP.
7. Hines, T. (2003) *Pseudoscience and the Paranormal*, 2nd Ed., Prometheus.
8. Schick, T. and L. Vaughn (2005) *How to Think About Weird Things*, 4th Ed., McGraw-Hill.
9. Stanley, Matt (2016) *Huxley's Church and Maxwell's Demon: From Theistic Science to Naturalistic Science*, Chicago. (Bobst access)

### **B. Articles (Online at course website)**

- Gordin, M. (2017) "The Problem with pseudoscience", *EMBO Reports* 18, 1482-5.

## IV. Requirements

**A. Exams** will be short-essays. Questions will be given out one week before the exam. A selection of those questions will appear on the exam. For example, you may receive a list of ten possible questions, of which seven will appear on the exam, and you will be asked to answer five. There will be two such exams: A midterm and a final.

**B. Assignments.** Depending on the finalized schedule, there will be one or two assignments due in class each week. These will consist of 3 discussion questions on the relevant reading assignments. Students will be asked to turn in one copy of their questions at the beginning of class, and keep a second copy.

**C.** One in-class **Presentation** is required of each student. Up to four students may present on any given day. Presentations will be evaluated by your fellow students and by myself.

*Requirements for Presentation*

1. Presentations should be 20 minutes long, with 10 minutes of questions-and-answers at the end.
2. Presentations must be based on research done in addition to the assigned class readings. A minimum of 2 additional references apart from assigned class material must be used.
3. You must meet with me (during office hours) at least twice before your presentation. Once briefly the week before the scheduled date to determine how a topic will be covered, and again for 15 minutes at least two days before the scheduled date to review the presentation.
4. Presentations must make a point and provide evidence and arguments to support that point. If the topic involves a debate, you must present arguments in favor of both sides. You need not take a neutral position, but both sides must be represented.
5. Your presentation should make use of presentation slides (e.g., powerpoint) that can be projected onto the screen at the front of the class. A pdf copy of these slides must be turned in prior to the presentation.
6. A follow-up essay of no more than 5 typed pages must be turned in within two weeks after the presentation. The essay must include a summary of the presentation, an analysis of the highlights of the class discussion (if any ensued), and a list of the references used for the presentation.

*Goals of Presentation*

- (a) To allow you to delve deeply into a single topic and to sift through different viewpoints on that topic.
- (b) To facilitate greater discussion in class by introducing more perspectives.
- (c) To practice critical reasoning skills.

**V. Grade Distribution**

Midterm: 25% Final: 25% Presentation: 30% Assignments & Class Participation: 20%

**VI. Reminders on University Policies**

1. **Community Standards and Procedures.** Please familiarize yourself with the NYU-Tandon Office of Student Affairs "Community Standards and Procedures" website: <http://engineering.nyu.edu/life/student-affairs/community-standards-procedures>. This website contains information relevant to:
  - (i) **Incompletes.** It is university and TCS policy that incompletes can be given only in extenuating circumstances (medical emergencies, accidents, etc.). An incomplete cannot be given because of a heavy course load, job commitments, or because you've simply fallen behind. For this reason, you must attend every lecture and make sure you're aware of assignment deadlines and exam dates. If for whatever reason you find yourself falling behind during the semester, do not hesitate to see the instructor as soon as possible. If you think you qualify for an incomplete grade at the end of the semester, see the procedure in (ii) below.
  - (ii) **Excused absences and missed exams.** If illness or an accident causes you to miss class or an exam, the Office of Student Affairs instructs you do to the following:
    - Notify your professor by email of your absence, the reason for it, and how long you think you may be away.
    - Obtain medical documentation and when you are back on campus see Judith Simonsen, Coordinator of Advocacy and Compliance in Dibner Hall Room LC 240C.
    - Do not provide anyone except her with a copy of your paperwork. If a professor requests a copy, refer them to Ms. Simonsen. This is to protect the confidentiality of your medical information
  - (iii) **University Honor System.** All students should be aware of the university policy on cheating and plagiarism in the Student Code of Conduct. Cheating on an exam, or plagiarizing on an essay assignment, are sufficient reasons for receiving an F in the course. The Code of Conduct can be downloaded from the Office of Student Affairs website listed above.
2. **Moses Statement.** If you are a student with a disability who is requesting accommodations, please contact the Moses Center for Students with Disabilities (CSD) at 212-998-4980, [mosescsd@nyu.edu](mailto:mosescsd@nyu.edu), [nyu.edu/csd](http://nyu.edu/csd), 726 Broadway, 2nd Fr. You must be registered with CSD to receive accommodations.

## VII. Tentative Schedule of Topics

To be finalized after student input.

<b>Week 1</b> (Jan 27, 29)	<b>Introduction</b> Theme: Demarcation? Mon: Read (Background): Harker (2015) Chaps 1, 2. Lecture - Confirmation and disconfirmation. Weds: Read: Gordin (2017); Schick & Vaughn (2005) pp. 273-8 ("SEARCH" formula). Lecture - Feasibility of demarcation criteria.
<b>Week 2</b> (Feb 3, 5)	<b>Naturalism: Origins</b> Theme: Historical contingency of science. Mon: Read: Stanley (2016) <i>Huxley's Church &amp; Maxwell's Demon</i> , Chaps 2, 3. Discussion - Uniformity of laws of nature; limits of science. Assignment: 3 discussion questions on reading (keep one copy and turn in another). Weds: Read: Stanley (2016) <i>Huxley's Church &amp; Maxwell's Demon</i> , Chaps 7, Conclusion. Discussion - Theistic science vs naturalistic science. Assignment: 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 3</b> (Feb 10, 12)	<b>Intelligent Design</b> Theme: What is a scientific explanation? Mon: Read: Harker (2015) Chap 9; Berra (1990) Chaps 1, 2. Lecture - Scientific Explanation I. Weds: Read: Berra (1990) Chaps 3, 4, 5. <b><i>Presentations</i></b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 4</b> (Feb 17, 19)	<b>20th Century Pseudoscience: Origins</b> Theme: Rhetoric and science. Mon: Read: Gordin (2016) <i>The Pseudoscience Wars</i> , Chaps 1, 2. Lecture - Scientific Explanation II. Weds: Read: Gordin (2016) <i>The Pseudoscience Wars</i> , Chaps 3, 6, Conclusion. Discussion - rhetoric of science; catastrophism vs uniformitarianism. Assignment: 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 5</b> (Feb 24, 26)	<b>Dinosaur Extinctions. I.</b> Theme: Scientific change: revolutions, paradigms, and all that. Mon: Read: Raup (2002) Chaps 1-4. [Background: Harker (2015) Chaps 3, 4.] Lecture - Scientific Change. Weds: Read: Raup (2002) Chaps 5, 6, 8, 12. <b><i>Presentations</i></b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 6</b> (March 2, 4)	<b>Dinosaur Extinctions. II.</b> Theme: Scientific change, continued. Mon: Read: Courtillot (2002) Chaps 2, 4. Lecture - Scientific Change, continued. Weds: Read: Courtillot (2002) Chaps 8, 9. <b><i>Presentations</i></b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).

<b>Week 7</b> (March 9, 11)	<b>Induction</b> Theme: Inductive reasoning. Mon: Read: Harker (2015) Chaps 5, 6. Lecture - Problem of Induction. Weds: <b>Midterm</b>
<b>Week 8</b> (March 16, 18)	<b>Spring Break</b>
<b>Week 9</b> (March 23, 25)	<b>Psychic Phenomena</b> Theme: Fallacies of reasoning. Mon: Reading: Harker (2015) Chaps 5, 6; Schick & Vaughn (2005) Chap 6. Lecture - Inductive Arguments and Fallacies. Weds: Read: Background: Hines (2003) Chaps 2-4. <b>Presentations</b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 10</b> (Mar 30, April 1)	<b>UFOs: Sightings, Cover-ups, Abductions!</b> Theme: Personal experience vs evidence: perception. Mon: Reading: Background: Hines (2003) Chaps 7, 8. <b>Presentations</b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another). Reading: Background: Hines (2003) Chaps 7, 8. <b>Presentations</b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 11</b> (April 6, 8)	<b>Astrology and Mystical Experiences</b> Theme: Knowledge and its acquisition. Mon: Reading: Background: Schick & Vaughn (2005) Chap 5. Lecture - Knowledge and Skepticism. Weds: Background: Hines (2003) Chap 6. <b>Presentations</b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 12</b> (April 13, 15)	<b>Intelligence and IQ</b> Themes: Causes vs correlations; scientific fraud. Mon: Read: Fancher (1985) Chaps 1, 2. Lecture - Cyril Burt and Scientific Fraud Weds: Read: Fancher (1985) Chaps 4, 5, 6. <b>Presentations</b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 13</b> (April 20, 22)	<b>Alternative Medicines</b> Themes: Causal reasoning; clinical studies. Mon: Read: Background: Schick & Vaughn (2005) xx. Lecture - Causal Arguments and Mills Methods Weds: Read: Background: Hines (2003) Chaps 10, 11; Schick & Vaughn (2005) Chap 8. <b>Presentations</b> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).

<b>Week 14</b> (April 27, 29)	<b>Climate Change</b> Themes: Creating scientific controversies; science and public policy. Read: Harker (2015) Chap 8. <i>Presentations</i> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another). <i>Presentations</i> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 15</b> (May 4, 6)	<b>Public Health Controversies</b> Themes: Creating scientific controversies; science and public policy. Read: Harker (2015) Chap 10. <i>Presentations</i> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another). <i>Presentations</i> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).
<b>Week 16</b> (May 11)	<b>Miscellaneous</b> Themes: Bad science vs pseudoscience. <i>Presentations</i> Assignment (non-presenters): 3 discussion questions on reading (keep one copy and turn in another).