

**STS 2011/SOC 2100: WHAT IS SCIENCE?
AN INTRODUCTION TO SCIENCE AND TECHNOLOGY STUDIES**

Course Instructor: Professor Kathleen Vogel
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Class meeting time: 10:10-11:00 a.m. MW + section

Classroom location: Goldwin Smith Hall, room 132

Course Description

This course introduces students to some of the central ideas in the field of Science and Technology Studies (S&TS). As well as serving as an introduction to students who plan to major in Biology and Society, or in Science and Technology Studies, the course is aimed at students with backgrounds in either the sciences, social sciences, or humanities who are curious to think more critically about what we mean by science and technology, what counts as scientific knowledge and why, and how science and technology intervene in the wider world. It allows students in science and engineering to reflect critically upon their own involvement in science and technology and consider the impact and implications of their work for society. At the same time, it offers students with backgrounds in the humanities and social sciences to develop a critical understanding of the role of science and technology in the world. The kinds of questions this class will explore include: How do we understand “science”? What counts as legitimate science, and what are its practices and norms? How do scientists establish their credibility? How are science and technology shaped by social context? Does technology determine the future? Is “technology” more than just machines?

The course is a mixture of lectures, seminar discussions, and other activities. Some lectures will be given by Cornell scientists and engineers and other guests. Also, we will watch some film clips about science and technology and take some tours of Cornell laboratories. Students are expected to complete assigned readings prior to lecture and to attend discussion sections. There is a detailed list of assignments and expectations at the end of the syllabus.

Course objectives

This course has two primary objectives:

- To have students identify and understand some key analytic issues and concepts in the field of Science and Technology Studies (S&TS).
- To teach students how to see and examine the social dimensions of how science and technology are developed, used, and discussed.

With these objectives, the course is designed to provide students with analytic skills and a base of knowledge for understanding the content and role of science and technology in our contemporary world.

Required Readings

Required readings consist of:

- Course packet (available at Kraftees in Collegetown, see: <http://www.kraftees.com/ithaca/>)
- On-line journal articles and other internet material (as specified in syllabus)
- Two books (also available at Kraftees in Collegetown)
 - Harry Collins and Trevor Pinch, *The Golem: What You Should Know About Science* (Cambridge: Canto, 2nd edition, 1998).
 - Harry Collins and Trevor Pinch, *The Golem at Large: What You Should Know About Technology* (Cambridge: Canto, 1998).

To help reduce costs, most required readings are from online sources. Some of these materials are open access, but most of the links can only be directly downloaded from computers on the Cornell network. The use of online materials will save you a substantial amount of money, since copyright fees can be very steep. The course website has an electronic version of the syllabus that includes clickable links. Because URLs change and publishers sometimes alter access policies, students are strongly encouraged to download and print PDFs or full-text versions of all online required readings during the first week of class. If URLs change, you should be able to go to the Cornell Library Catalog website and find the readings; you will have to look up the journal and track down the source using the citation given. If you do not know how to do this, consult a reference library. It is your responsibility to obtain full-text copies of all online readings.

A copy of the course packet and required books will also be placed on reserve at Uris Library.

Blackboard

This course has a Blackboard site, which will be used for several purposes. Some of the readings and links to websites will be marked accordingly on the syllabus posted on Blackboard. Other relevant course materials will be found on Blackboard. Also, I will undoubtedly post some last-minute announcements and reminders so you will want to check the site regularly. It is your responsibility to enroll in the course's Blackboard site so please do so as soon as possible. You will need your Cornell NetID and a Blackboard user account.

Statement on Academic Integrity

The Cornell Code of Academic Integrity states: "Absolute integrity is expected of every Cornell student in all academic undertakings. Integrity entails a firm adherence to a set of values, and the values most essential to an academic community are grounded on the concept of honesty with respect to the intellectual efforts of oneself and others. . . .A Cornell student's submission of work for academic credit indicates that the work is the student's own. All outside assistance should be acknowledged, and the student's academic position truthfully reported at all times. In addition, Cornell students have a right to expect academic integrity from each of their peers." The complete statement of the student code of academic integrity is at: <http://www.cuinfo.cornell.edu/Academic/AIC.html>.

Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. In the context of this course, academic integrity includes writing your own quizzes, papers, exams, reading responses, as well as faithfully referencing all sources, and using quotation marks to indicate material that is quoted directly. Violations will be handled in accordance with the strictest applicable university policies. The complete statement of student responsibilities can be found at: <http://theuniversityfaculty.cornell.edu/docs/AI.Acknow.pdf>.

Examples of how to use sources correctly (with examples and exercises): <http://plagiarism.arts.cornell.edu/tutorial/index.cfm>

Examples of citation styles: http://www.library.cornell.edu/newhelp/res_strategy/citing/index.html

Email policy

The e-mail addresses of all course instructors are given below. We encourage you to use e-mail to schedule appointments or address other administrative matters. E-mail must not be used for asking questions about course content. You can easily imagine why it is impossible for the instructors to address substantive questions about course material via e-mail, given the numbers of students in the course and the fact that the typical question requires a lengthy, written response. All of us appreciate your following this important ground rule about e-mail communication. We strongly encourage you to ask questions about course content in office hours.

Office Hours

Students are encouraged to make use of office hours. E-mail addresses and office hours are given for each course staff member below. (*Note again:* E-mail should be used primarily for scheduling appointments, not for asking substantive questions that require a lengthy, written response.)

- Carmen Krol: T, 1-3 pm in 172 Rockefeller Hall or by appointment, cvk8@cornell.edu
- Prof. Kathleen Vogel: M, 2:30-4:30 pm in 154 Uris Hall or by appointment, kmv8@cornell.edu

COURSE SCHEDULE

Monday, January 25: Introduction

- No reading assignment

Wednesday, January 27: Introduction to Science and Technology Studies

- Collins and Pinch, *The Golem*, Introduction: the golem, p. 1-3.

UNDERSTANDINGS OF SCIENCE

Monday, February 1: Observation

- Samuel Hubbard Scudder, "Learning to See," in John Hatton and Paul B. Plouffe (eds), *Science and Its Ways of Knowing* (Upper Saddle River, NJ: Prentice Hall, 1997): 143-146. [Course packet]
- Charles Goodwin, "Professional Vision," *American Anthropologist*, vol. 96, no. 3 (September 1994): 606-633. Accessible at: <http://www.jstor.org/stable/pdfplus/682303.pdf>

Wednesday, February 3: Observation

- Collins and Pinch, *The Golem*, Chapter 7, "Set the Controls for the Heart of the Sun: The Strange Story of the Missing Neutrinos," p. 121-138.
- Londa Schiebinger, "More Than Skin Deep: The Scientific Search for Sexual Difference," in *The Mind Has No Sex? Women in the Origins of Modern Science* (Cambridge: Harvard University Press, 1989): 189-213. [Course packet]

Monday, February 8: Experiment, Demonstration, and Proof

- Collins and Pinch, *The Golem*, Chapter 2, "Two Experiments that Proved the Theory of Relativity," p. 27-55.
- Collins and Pinch, *The Golem at Large*, Chapter 3, "Crash! Nuclear Fuel Flasks and Anti-Misting Kerosene on Trial," p. 57-75.

Wednesday, February 10: Scientific Methods

- Karl Popper, "Science: Conjectures and Refutations," in *John Hatton and Paul B. Plouffe (eds), Science and Its Ways of Knowing* (Upper Saddle River, NJ: Prentice Hall, 1997): 81-86. [Course packet]
- Collins and Pinch, *The Golem*, Chapter 1, "Edible Knowledge: The Chemical Transfer of Memory," p. 5-25.

Monday, February 15: Scientific Discoveries

- Anne Sayre, "The Making of Scientific Discovery," in *Rosalind Franklin and DNA* (New York: W.W. Norton & Company, Inc., 1975): 108-119. [Course packet]

Wednesday, February 17: Norms

- Robert K. Merton, “The Normative Structure of Science,” in Norman W. Storer (ed.), *The Sociology of Science: Theoretical and Empirical Investigation* (Chicago: The University of Chicago Press, 1973): 267-278. [Course packet]
- Ian I. Mitroff, “Norms and Counter-Norms in a Select Group of the Apollo Moon Scientists: A Case Study of the Ambivalence of Scientists,” *American Sociological Review*, vol. 39, no. 4 (August 1974): 579-595. Accessible at: <http://www.jstor.org/stable/pdfplus/2094423.pdf>

Monday, February 22: Moral Economies in Technical Spaces

- Robert E. Kohler, “Moral Economy, Material Culture, and Community in *Drosophila* Genetics,” in Mario Biagioli (ed.), *The Science Studies Reader* (New York: Routledge, 1999): 243-257. [Course packet]

Wednesday, February 24: Guest Lecture, TBA

PRACTICES OF SCIENCE

Monday, March 1: Tacit Knowledge and Replication

- H.M. Collins, “Tacit Knowledge, Trust and the Q of Sapphire,” in *Social Studies of Science*, vol. 31, no. 1 (February 2001): 71-85. Accessible at: <http://www.jstor.org/stable/pdfplus/285818.pdf>

Wednesday, March 3: Serendipity, Magic, and Ritual

- Bernard Barber and Renee C. Fox, “The Case of the Floppy-Eared Rabbits: An Instance of Serendipity Gained and Serendipity Lost,” *The American Journal of Sociology*, vol. 64, no. 2 (September 1958): 128-136. Accessible at: <http://www.jstor.org/stable/pdfplus/2773682.pdf>
- Alberto Cambrosio and Peter Keating, “Going Monoclonal: Art, Science, and Magic in Day-to-Day Use of Hybridoma Technology,” *Social Problems*, vol. 35, no. 3 (June 1988): 244-260. Accessible at: <http://www.jstor.org/stable/pdfplus/800621.pdf>

Monday, March 8: Scientific Representation

- Bruno Latour, “Is it Possible to Reconstruct the Research Process?: Sociology of a Brain Peptide,” in Karin D. Knorr, Roger Krohn, and Richard Whitley (eds.), *The Social Process of Scientific Investigation* (Dordrecht: D. Reidel, 1980): 53-73. Accessible at: <http://www.bruno-latour.fr/articles/article/10-SOMATOSTATIN.pdf>
- Kelly Joyce, “Appealing Images: Magnetic Resonance Imaging and the Production of Authoritative Knowledge,” *Social Studies of Science*, vol. 35, no. 3 (June 35): 437-462. Accessible at: <http://sss.sagepub.com/cgi/reprint/35/3/437>

Wednesday, March 10: Pedagogy and Lab Practice

- Sharon Traweek, “Pilgrim’s Progress: Male Tales Told During a Life in Physics,” in Mario Biagioli (ed.), *The Science Studies Reader* (New York: Routledge, 1999): 525-542. [Course packet]

SOCIOTECHNICAL BOUNDARIES IN SCIENCE

Monday, March 15: Boundary-work

- Thomas F. Gieryn, "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists," *American Sociological Review*, vol. 48, no. 6 (December 1983): 781-795. Accessible at: <http://www.jstor.org/stable/pdfplus/2095325.pdf>

Wednesday, March 17: UFOs and Mainstream Science

- Guest lecture: Peter Robbins, UFO researcher
- Ron Westrum, "Knowledge About Sea-Serpents," in Roy Wallis (ed.), *On the Margins of Science: The Social Construction of Rejected Knowledge* (Keele: University of Keele, March 1979): 293-314. [Course packet]
- Harry Collins and Trevor Pinch, "Alternative Medicine: The Cases of Vitamin C and Cancer," *Dr. Golem: How to Think About Medicine* (Chicago: The University of Chicago Press, 2005): 84-111 [Course packet]

Monday, March 22: Spring Break—no class

Wednesday, March 24: Spring Break—no class

Monday, March 29: Mid-term exam

Wednesday, March 31: Lab Tour, Cornell High Energy Synchrotron Source

- Meet at 200L Wilson Lab, Rte 366 and Pine Tree Road
- Further instructions for how to get to the synchrotron will be posted on Blackboard, a campus map is available: http://www.chess.cornell.edu/misc/large_search.pdf

Monday, April 5: Lab Spaces and Cultures

- Bruno Latour and Steve Woolgar, *Laboratory Life: The Social Construction of Scientific Facts* (Beverly Hills: Sage, 1979): 11-18 and 43-53 and 93-103. [Course packet]
- Steven Shapin, "The Invisible Technician," *American Scientist*, vol. 77 (November-December 1989): 554-563. Accessible at: http://www.fas.harvard.edu/~hsdept/bios/docs/shapin-invis_tech.pdf

Wednesday, April 7: Guest Lecture, Professor Park Doing, Bovay Program in the History and Ethics of Engineering, Cornell University

- Park Doing, "Birth of a Hybrid Laboratory," in *Velvet Revolution at the Synchrotron Biology, Physics, and Change in Science* (Cambridge: MIT Press, 2009): 1-21. Accessible at: <http://mitpress.mit.edu/books/chapters/026204255Xchap1.pdf>

Monday, April 12: Credibility and Trust

- Steven Shapin, “Trust, Honesty, and the Authority of Science,” in R.E. Bulgar, E.M. Bobby, and H.V. Fineberg (eds), *Society’s Choices: Social and Ethical Decision Making in Biomedicine* (Washington, DC: National Academy Press, 1995): 388-408. [Course packet]
- Collins and Pinch, *The Golem*, Chapter 3, “The Sun in a Test Tube: The Story of Cold Fusion,” p. 57-78.

Wednesday, April 14: The Making of Expertise

- Stephen Hilgartner, “Introduction,” in *Science on Stage: Expert Advice as Public Drama* (Stanford: Stanford University Press, 2000): 3-20. [Course packet]
- Collins and Pinch, Chapter 6, *The Golem at Large*, “The science of the lambs: Chernobyl and the Cumbrian sheepfarmers,” p. 113-125 or Collins and Pinch, Chapter 7, *The Golem at Large*, “ACTing up: AIDS cures and lay expertise,” p. 126-150.

THINKING ABOUT TECHNOLOGY

Monday, April 19: Conceptions of Technology and Technological Choices

- David E. Nye, “Can We Define Technology,” in *Technology Matters: Questions to Live With* (Cambridge: MIT Press, 2006): 1-15. [Course packet]
- Jared Diamond, “The Curse of QWERTY,” *Discover* (April 1997). Accessible at: <http://discovermagazine.com/1997/apr/thecurseofqwerty1099/>
- Paul A. David, “Clio and the Economics of QWERTY,” *The American Economic Review*, Vol. 75, No. 2, Papers and Proceedings of the Ninety-Seventh Annual Meeting of the American Economic Association. (May, 1985): 332-337. Accessible at: <http://www.jstor.org/stable/pdfplus/1805621.pdf>
- Kate Ellis and Mike Kent, “iTunes Is Pretty (Useless) When You’re Blind: Digital Design Is Triggering Disability When It Could Be a Solution,” *M/C Journal*, vol. 11, no. 3 (2008). Accessible at: <http://journal.media-culture.org.au/index.php/mcjournal/article/viewArticle/55>

Wednesday, April 21: Technological Testing

- John Downer, “When the Chick Hits the Fan,” *Social Studies of Science*, vol. 37, no. 1 (February 2007): 7-26. Accessible at: <http://sss.sagepub.com/cgi/reprint/37/1/7>

SCIENCE, TECHNOLOGY, AND POLITICS

Monday, April 26: Technological Disasters

- Wiebe E. Bijker and John Law, “General Introduction,” in Wiebe E. Bijker and John Law (eds.), *Shaping Technology/Building Society: Studies in Sociotechnical Change* (Cambridge: MIT Press, 1992): 1-4. [Course packet]
- Collins and Pinch, Chapter 2, “The naked launch: assigning blame for the Challenger explosion,” p. 30-56

Wednesday, April 28: Politics and Policy

- Jeronimo Cello, Aniko V. Paul, Eckard Wimmer, “Chemical Synthesis of Poliovirus cDNA: Generation of Infectious Virus in the Absence of Natural Template,” *Science*, vol. 297, no. 5583, (9 August 2002): 1016-1018 (also read supporting materials). Accessible at: <http://www.sciencemag.org/cgi/reprint/297/5583/1016.pdf>
For supporting materials, see: <http://www.sciencemag.org/cgi/content/full/1072266/DC1>

Monday, May 3: The Politics of “Yellow Rain,” Guest Lecture, Professor Thomas Seeley, Department of Neurobiology and Behavior, Cornell University

- Matthew S. Meselson and Julian Perry Robinson, Chapter 4, “The Yellow Rain Affair: Lessons from a Discredited Allegation, in Anne L. Clunan, Peter R. Lavoy, Susan B. Martin (eds), *Terrorism, War, or Disease? Unraveling the Use of Biological Weapons* (Stanford: Stanford University Press): 72-96. Accessible at: <http://belfercenter.ksg.harvard.edu/files/Meselsonchapter.pdf>

Wednesday, May 5: Wrap Up

- Sheila Jasanoff, “Ordering knowledge, Ordering Society,” in Sheila Jasanoff (ed.) *States of Knowledge: The Co-production of Science and Social Order* (London: Routledge, 2004): 13-15. [Course packet]

GRADING

Your final grade will be determined as follows:

Section participation:	20%
Reading Responses:	10%
In-class quizzes:	20%
Mid-term:	20%
Final exam:	30%

Please find described below a brief description of each portion of your grade.

Section Participation (Note: a special 4 credit writing section can only be taken with permission of the instructor and has its own requirements; see separate document)

Sections will begin the week of January 25th and continue throughout the term. Attendance at all sections is required. In general, the readings assigned for the two previous lectures are the focal point of each week’s section, however, it is your responsibility to keep track of which topics will be discussed on which dates. You should come to section prepared – that is, having not only completed the reading(s), but also reflected upon them so that you are ready to discuss them in class. In section discussions, students are expected to demonstrate an understanding of course materials and to engage critically with them. Please remember: regular attendance and consistent participation in section will undoubtedly help you be more successful on the formal assignments. You may miss two sections without penalty.

The section participation grade will consist of two components: (1) attendance and participation in section discussion; (2) leading a section discussion on the assigned reading(s). The start of student-led section discussions will begin the week of February 8th; more than one student may be assigned to lead section. On the days that a student leads section discussion, s/he will turn in a one page discussion outline as a substitute for the reading response for that day; the outline should also include 4 questions for discussion. More guidance on these student-led discussions will be given in section. Section participation will constitute 20% of your grade.

Reading Reflection (Note: the 4 credit writing section has its own requirements; see separate document)

Starting the week of February 1st, students will be required to turn in a reading reflection as part of section. A reflective response enables the documentation of experiences, thoughts, questions, ideas and conclusions that allow for critical and cumulative inquiry about the assigned reading(s). The reflection should be no more than one double-spaced, typed page and it should include one question that you would like to raise for discussion in section. The style of writing should be both personal and reflective; however, we do not want to hear about your social life on the weekends, random musings, disjointed streams of consciousness, or other non-course related issues.

To encourage honest and personal writing, these reflections will not be assessed for grammar or style, but are expected to show thoughtful engagement with the reading(s). If they do, then you will receive full credit, as marked by a “√”. On the other hand, reflections that show poor engagement with the readings, do not include a question, or otherwise demonstrate lack of effort will be deemed “unacceptable” and will be give a “0”. In general, unless the reflection is deemed unacceptable, no written comments will be given on reflections other than a “√” indicating that successful completion was recorded.

The reflections are due in section and you should come prepared to raise your question aloud in section. You cannot have a friend deliver a reflection to section for you, or email your reflection electronically. You may turn in two reflections late without penalty to your grade as long as the response is turned in a hard copy format within a week of the original due date. Other late responses will not receive credit. You must complete ten reading responses for this portion of your grade. The reading responses will constitute 10% of your grade.

Pop quizzes

Six pop quizzes will be given over the semester in lecture and/or section. If you’ve been coming to lecture regularly and kept up with the readings, you should do well on the quizzes. Make-up quizzes will **only** be given for absences excused ahead of time. The pop quizzes will constitute 20% of your grade.

Mid-Term Examination

In order to evaluate your knowledge of basic course content, the mid-term will include some or all of the following: multiple choice, quotation analysis, identifications, and short-answer questions. To assist you in studying, I will present examples of what the test will cover and sample questions prior to the exam. The midterm examination will be held *in class on Monday, March 29th* and will count for 20% of your grade.

Final Examination

The final exam will be similar to the mid-term and will be held during our university-scheduled final exam time slot on *Monday, May 17th from 9:00-11:30 am, location TBA*. Once the university releases the location for the exam I will put that information on Blackboard. The final exam will count for 30% of your grade. For your preparation, I will also present examples of what the final will cover prior to the exam.

GENERAL ASSIGNMENT POLICIES

Unless otherwise noted, all assignments are due in class (either lecture or section, as specified on the assignment) and must be submitted in order to earn a passing grade in the course. Electronic submissions are not accepted, unless specified on the assignment or alternative arrangements have been made due to an emergency. Late assignments will be penalized one-third of a letter grade (e.g., B+ to B) immediately, and one-third of a letter grade for each subsequent day the assignment is late. Make-up assignments as well as extensions will **only** be given for legitimate extenuating circumstances – that is, medical conditions, family emergencies, and religious holidays. Students with disabilities are encouraged to contact me privately at the beginning of the semester so that we can make appropriate arrangements. Alternative arrangements will not be made for students departing early for spring break or the end of the academic year.