The Art of Science, the Science of Art

Mondays and Wednesdays 1:30-2:50pm Blair Hall, T5 Janet Vertesi 104A Scheide Caldwell House jvertesi@princeton.edu or 609-258-9053

Office hours: Wednesday 12:30-1:30pm or by appointment

Science: an objective and rational pursuit of natural truths. Art: a subjective and emotional pursuit of human creativity. We are often taught that these two categories, with their associated practices, artifacts, and institutions, are opposites. But how are they really intertwined in the same endeavor, understanding and representing the world around us?

Over the course of the semester you will engage with case studies from across 400 years of history of science and art history; you will watch, read, and discuss 20th-century science fiction; and you will engage with the values that underlie our distinctions between cultural categories, the values that we also design into our everyday technologies, a space where science and art come together. We will ask: How does science use art in order to illustrate, teach, or convince, and does art use science to the same ends? What craft or community and institutional practices do they have in common? And how might we fruitfully explore these interdisciplinary relationships as scientists, artists, or as producers and consumers of designed artifacts? Accessible to students from all disciplines, this course provides an introduction to the interdisciplinary and growing field of science and technology studies, which explores the role that science and technology play in our society

This introductory course will explore these questions while developing your toolset as a college-level writer and critical thinker. Over the course of the semester you will engage with and write about examples drawn from the histories of art and science, develop your writing and critical thinking skills for an academic environment, and get a taste of Science and Technology Studies, a field which explores the role that science and technology play in our society.

Materials and Assignments

An evolving **syllabus** is on our Blackboard course website, listing the themes and readings for each week, as well as the due-dates for take-home assignments. Readings will either be found on the library's electronic course reserves or on the course site, and it is your responsibility to make sure that you have read them before you come to class, where you will be expected to discuss and write about them.

There are **four units** of the course, and each one has a corresponding **take-home assignment**. The assignment deadlines are clearly marked on the schedule. Assignments should be typed and, unless otherwise stated, printed out. The font and formatting should not overshadow your writing! I recommend you use Times New Roman, Garamond or Arial, size 11 or 12 point, Aligned left or justified, and double space paragraphs to leave room for comments.

Please note that all **requests for extensions** must be made in advance: not handing in an assignment by the pre-arranged due date will grant you a zero on that assignment.

But as this is also class about science and *art*, you should **do some 'viewings' as well**! Any images I recommend or display in class will be posted on our course website in the Images section, but don't forget that scientific illustrations, visualization software, photographs of scientists, scientific icons, science fiction movies and techno-critical art are all around you. Look at the scientific illustrations in your textbooks, in science magazines, on your computer screen, in the news, at art galleries, or at the movies, and start thinking and talking about what you see...

We will also begin each class with **a brief student presentation** of some viewing that is of interest to the course. When it is your turn, try to find something that speaks to the materials we are talking about that week, or something that we have covered in the semester already. I will set up a series of links on Blackboard to well-known science sites to get you started, but you are welcome to bring in any scientific or artistic image (or otherwise) that speaks to the course topic and material. The level of care, originality, and thought put into this assignment will be reflected in your participation grade.

A Few Ground Rules...

Participation: This is not a lecture course; our classes will be built around discussions and activities, which means they will only be fun if you share your opinions, ideas, and questions, and get involved! In fact, learning how to express yourself in class is an important part of the university experience, and is a skill that will affect your writing. In-class participation – in the discussions, in the presentations, and in the writing activities – will make up 10% of your final grade.

Meetings: One of the most important tools for navigating college courses is to go and talk to your professors! In the second week of term, we will have a welcome meeting in which we discuss your interest in the course and your goals for the semester. Outside of that, you are welcome to come and talk to me any time, email me if you have any questions or difficulties, and see me during office hours or schedule another time that works better for you.

Attendance: You are expected to come to class, having completed the reading and/or writing assignments due that day. If you have to miss a class, you must contact me beforehand with a valid excuse either by email at jvertesi@princeton.edu, or by phone at 609-258-9053. After two unexcused absences, every further class you miss will subtract a third of a letter (i.e. A-, B+, B...) from your final grade.

Grading Breakdown

Participation: 10%

Science Fiction Presentation: 10%

Four take-home assignments: 60 (15% each)

Final paper (8-10 pages): 20%

Participation Policies

In our courses, participation is judged by quality rather than quantity. Monopolizing the conversation or intervening with off-the-cuff remarks or digressions is not a goal. Rather, we expect students to prepare assignments in advance – reading, underlining, formulating questions and comments. In class we value the ability to encourage the opinions of others and advance the discussion. Against this background, these are some characteristics of specific grading ranges:

- A. Students come to each class with questions/comments based on careful reading and thinking about the assignments; have grappled with the material and assumed some responsibility for it; encourage others to formulate their ideas; listen attentively and forward or debate the comments of predecessors with the goal of elucidating and going deeper into the material.
- B. Students are present but their comments do not reflect a serious prior engagement with the texts; they may speak merely to be heard or wait for others to ask interesting questions and then react. Although they listen to other students, they do not make an effort to integrate others' views into the ongoing discussion. They express opinions as opposed to articulating ideas.
- C. Students attend class regularly but their engagement is perfunctory or irrelevant; contributions may be sporadic or digressive and not informed by careful preparation. They may hammer positions or, conversely, fail to realize which issues are at stake.
- D. /F. Students miss class; are not prepared.

(From: Council of the Humanities Grading Guidelines)

Ways to be sure you are participating properly:

Are you listening to your instructor? To your peers? Are you listening actively?

Are you asking questions of your peers? Are you respecting what they have to say? Do you respond respectfully and thoughtfully to their comments?

Do you prepare questions or thoughts to share in class based on your readings?

Are you asking questions about material you don't understand?

Are you drawing connections to other course material?

Do you come to class well-rested, fed, and leaving distractions at the door?

Do you turn off your phone, wifi devices, chat systems, and other electronic communication systems so that you may give your full attention to what is going on in class?

Grading Policies

In grading your assignments I will consider the following questions:

- Did you address or answer the question or assignment? How deeply have you thought about the question, who your audience is, and how to present your answer?
- Do you make a point, an argument, a point or a thesis? Can I identify what this is?
- How well do you support your argument with examples and explanations?
- How well do you know the course material, and do you use it or other examples in supporting your argument?
- How good is your spelling, punctuation and grammar?
- What sources do you use? Do you use them appropriately, and do you document them properly?

How enthusiastically I can answer these questions will determine your grade along the following general scale:

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90%-100% (~A): excellent
80%-90% (~B): very good
70%-80% (~C): good but could be improved
60%-70% (~D): needs serious improvement
below 50% (~F): unsatisfactory
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A or A- These papers represent genuinely distinguished, exceptional work, good enough to be read aloud in class. They show intellectual originality and creativity. The writers have a detailed understanding of the material; they place it in context and formulate perceptive compelling, independent arguments, supported by well-chosen evidence. Papers are clearly written, well-organized and proofread to avoid errors. At the end readers have learned something worth knowing.

B+ or B These papers have a clear thesis, organization and flow. The writers have obviously put thought into the work. The arguments are reasonable and substantiated by evidence. The results are solid, but lack the originality of voice or thesis of A papers. Some B papers are creative and original but sloppily presented. Writers may have flashes of insight that are not sustained or excellent ideas that are not presented as coherently as they should be. These papers are competent but not compelling.

B- Writers have understood the issues and their context; they have a valid argument, based on research, but their presentations are handicapped by weaknesses in writing, organization or use of evidence.

C+, C or C- These are some ideas here, but the writer needs help making them clear to a reader. Papers in this range often summarize existing material without offering new interpretations, or they omit crucial facets of an issue. The main arguments may be banal or unclear. This in turn hinders the effort to marshal evidence or argue convincingly. Papers may suffer from inadequate research, organization or context. Students may use Spell Check but fail to proofread their texts.

D/F These papers demonstrate serious deficiencies in a writer's command of the material; they lack the research or reflection necessary to make a coherent, substantiated argument.

(From: Council of the Humanities Grading Guidelines)

Using Sources

One of the most important features of university writing is a good grasp of your sources: who and what they are, what they are saying, how they say it, and your critical appraisal of what they say and how well they say it. Understanding and using sources well requires knowing first of all what an academic source is, and secondly, what kind of uses of sources academics consider acceptable or unacceptable.

The internet is not, wholesale, an academic source. Certainly, many academic sources can be found online, but in this course we will learn which are appropriate to use as sources in your university career, and how best to use and sort through information on the internet. To this end, please note that no more than 1 out of every 5 of your sources may be information solely accessible on the internet. This includes personal, commercial and organizational websites, such as personal or academic pages on art and science, NASA's public image database, or the Hubble Space Telescope website.

Certain academic electronic sources are exempt from this rule. These can usually be found in both an online and print format; for example:

- Magazines or newspapers with online versions, such as the New York Times, Scientific American, Science or Nature,
- Academic journals, such as those accessed through JSTOR,
- Historical scientific texts with illustrations, such as those accessed with Early English Books Online or Octavo,
- Dictionaries such as the Oxford English Dictionary or Websters' (not dictionary.com), and encyclopedias such as Encarta or Brittanica.

All sources — electronic and paper — must be referenced with the appropriate formatting. Whether you choose MLA, Chicago style, APA or typical formats in the sciences, please make sure you are consistent! Also, please note that I will consider your choice of sources in your papers towards your grade, so use your judgment wisely! If you have any doubts as to whether or not a website not on the list constitutes a reliable source, send me an email with the URL and I will check it out for you as soon as I possibly can. I will also use the Links section on our course website to give you a good idea of where to start, and what sites I have approved.

Academia is all about using sources: reading them, talking about them, critiquing them or exploring them. We will talk more in class about what kinds of sources academics use and how it is acceptable to use them. But there is also the unacceptable use of sources, **plagiarism**: put simply, this is passing off someone else's work or ideas as your own, without crediting them properly. Please note that *inappropriate use of sources will not be tolerated*, *period*. Plagiarized assignments will result in a mark of zero, and subjection to the regulations of the University's policy on plagiarism and academic integrity.

COURSE SCHEDULE AND READINGS

All readings and assignments should be completed by the date under which they are listed. This syllabus is preliminary. Readings and schedule liable to change subject to the instructor.

UNIT 1: The Art of Science I: Images of/in science

February 2 What does genius look like?

- Fara, "Images of Newton," "Pictures of Charles Darwin," in Endeavour (2000) 24.4:143-142, Newton: 2000;24(2):51-2.
- Goffman: Presentation of self in everyday life, New York, Doubleday 1959, pp.208-212

February 7 From the moon to Mars

- Bloom (1978) "Borrowed Perceptions: Harriot's maps of the moon," Journal of the History of Astronomy 9: 117-122.
- Maria Lane, Mapping the Mars Canal Mania: Cartographic Projection and the Creation of a Popular Icon *Imago Mundi 58:2 (2006): 198-.211*

February 9 Digital Image Processing

- Lynch & Edgerton (1996), "Abstract Painting and Astronomical Image Processing: From Pictorial Schemata to (non)representational Techniques," in A.I. Tauber (ed), The Elusive Synthesis: Aesthetics and Science, pp.103-124.
- Jim Bell, Postcards from Mars, p.1-3

February 14 Picturing the Brain

- Joseph Dumit, "Is it me or my brain? Depression and Neuroscientific Facts," *Journal of Medical Humanities*, Vol 24 (2003) 35-47.
- Anne Beaulieu, Images are not the (only) Truth, Science Technology and Human Values 2002, 27:53-86

February 16 How images matter

• Bruno Latour, "Visualization and Cognition: Drawing Things Together."

UNIT 2: The Art of Science II: Science as art or craft

February 21 Image Making as Practical Process

- Michael Lynch. The Externalized Retina. Human Studies 11:201-234 (1988).
- *Unit 1 Assignment due (10%)

February 23 Objectivity and Subjectivity

• Daston & Galison (1992), "The Image of Objectivity," Representations 40: 81-128

February 28 What is really true? The debate about manipulation

• Rossner, M and KM Yamada, "What's in a Picture? The Temptation of Image Manipulation," *The Journal of Cell Biology*, vol. 166, 2004, chap. 1, pp. 11-15

March 2 What do craftsmen know?

- Shapin, "The Invisible Technician," American Scientist, 77: 554-563.
- Pamela Smith, The Body of the Artisan, pages TBA.

March 7 Does science need bodies?

- Natasha Myers. "Molecular Embodiments and the Body-work of Modelling in Protein Crystallography," *Social Studies of Science* 2008: 38: 163-199.
- Janet Vertesi, "Seeing Like a Rover: Visualization, Embodiment and Interaction on the Mars Exploration Rover Mission," (forthcoming).

March 9 Field trip

UNIT 3: The Science of Art I: Science in art, film and fiction

March 21-March 23 No class

- No class. Time is free for watching movies assigned to you for pairs project.
- *Unit 2 Assignment due by email Monday, March 21 (10%)

March 28-30 Science Fiction Films

• **Presentations (10%)** on *Avatar* (James Cameron, 2009), *Tron* (Steven Lisberger, 1982), *The Matrix* (Andy & Lana Wachowski, 1999), *Blade Runner* (Ridley Scott, 1982), and *2001: A Space Odyssey* (Stanley Kubrick, 1968).

April 4-6 Cyberpunk

- April 4: William Gibson, Neuromancer (1984) first half.
- April 6: William Gibson, Neuromancer (1984) second half.

April 11-13 Science on Stage

- April 11: Michael Frayn, Copenhagen (1998). Act 1.
- April 13: Michael Frayn, Copenhagen (1998). Act 2.

UNIT 4: The Science of Art II: Technological Art

April 18 The Futurists

- Marinetti, F.T. "The Founding and Manifesto of Futurism." Le Figaro, Feb 20, 1909.
- Boccioni, Umberto, et al. "Technical Manifesto of Futurist Painting." Poesia, April 11, 1910. Online at Futurism: Manifestos and Other Resources.
- Kemp, Boccioni's "Ballistics," (2 pages)
- *Unit 3 Assignment due (10%)

April 20 Critical Design in Technology

• Dunne and Raby, "Designer as Author," in Design Noir: The Secret Life of Electronic Objects, August: Birkhauser, 2001.

April 23 What are media and why should we care?

- William Ivins Jr., Prints and Visual Communication (Cambridge: MIT Press, 1953): Read pp.21-30, 47-50.
- Website of the Critical Art Ensemble (as posted under Readings).

April 25 Peer Editing workshop

- Bring a draft of your final paper to class
- * Unit 4 Assignment due (10%

April 27 Wrap-up discussions and final project presentations

• * Final paper due Dean's Date