

History of Science 905 Modern Physical Science

Cultures of Physics: The Physics of Culture

Fall 2007

3 Credits

2:25-4:25 pm Tuesday, 6109 Social Sciences

Prerequisites: Grad standing or consent of instructor

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Office Hours: 2:25 M, 11:00 T

This seminar will examine the relations among culture and science historically by following two different strategies. One strategy is to explore how scientists approach those relations themselves, focusing first on physicists and examining a rich variety of sources ranging from philosophical discussion and fantasies about the knowledge of extraterrestrial beings, through to invocations of national styles and terms like German, British and Jewish physics. Our readings will explore how scientists in specific social settings have grappled with what it means to pursue natural knowledge, paying particular attention to the way their debates have drawn on different cultural resources, often functioning to mark boundaries and define disciplines (while expressing quite different imperatives over time).

Our second strategy will be to explore how resources from the physical sciences have been used by other disciplines to examine culture. Here we pay attention to material tools, like anthropological and psychological tests designed to understand human perception and test differences between different cultures; to the use of intellectual resources in different contexts (especially statistics); and to the relations between social and physical epistemologies (like relativity and cultural relativism, for example).

No prior acquaintance with physics or its history is required, and students will have the possibility of investigating these issues in different sciences and over the period from Newton to the science wars.

Booklist

Steven Shapin and Simon Schaffer. *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life: including a translation of Thomas Hobbes, Dialogus physicus de natura aeris by Simon Schaffer*. Princeton, NJ: Princeton Univ. Press, 1985.

George W. Stocking. *Race, Culture, and Evolution: Essays in the History of Anthropology*. Chicago: Univ. of Chicago Press, 1982.

Assessment

Each student will be required to submit 20-30 pages of scholarly prose, which may be composed of a combination of different essays (book reviews, a bibliographical or historiographical essay, one or more research papers), as determined by individual needs. The preferred due date is December 14, the final due date is December 21.

Syllabus

Week 1: Sept. 4

Orientations

Part 1: The Scientific Revolution and the History of Objectivity

Week 2: Sept. 11

Experimental Learning

Steven Shapin and Simon Schaffer. *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life: including a translation of Thomas Hobbes, Dialogus physicus de natura aeris by Simon Schaffer*. Princeton, NJ: Princeton Univ. Press, 1985.

Week 3: Sept. 18

On Wonders, Order, and Physico-Mathematical Learning

Lorraine Daston and Katharine Park. *Wonders and the Order of Nature, 1150-1750*. New York/Cambridge, MA: Zone Books, 1998, chaps. 5 and 6 on “Monsters: A Case Study” and “Strange Facts.”

Peter Dear. *Discipline and Experience: The Mathematical Way in the Scientific Revolution*. Chicago/London: Univ. of Chicago Press, 1995, chaps. 6 and 8, “Art, Nature, Metaphor: The Growth of Physico-Mathematics” and “Barrow, Newton, and Constructivist Experiment.”

Week 4: Sept. 25

Intellectual Boundaries and Historical Epistemology in the Long Durée

Mary Terrall. *The Man who Flattened the Earth: Maupertuis and the Sciences in the Enlightenment*. Chicago: The Univ. of Chicago Press, 2002, chaps. 7 and 9, “Toward a Science of Living Things,” and “Teleology, Cosmology, and Least Action.”

Lorraine Daston and Peter Galison. “The Image of Objectivity,” *Representations* 40 (1992):81-127.

Steven Shapin. “Discipline and Bounding: The History and Sociology of Science as Seen through the Externalism-Internalism Debate.” *History of Science* 30 (1992): 333-369.

Part 2: Physics and Anthropology, circa 1900: From Descriptionism to Cultural Relativism

Week 5: Oct. 2

The Mind-Body Relationship: Psychophysics and Machian Sensationalism

Selections from Michael Heidelberger. 2004. *Nature from Within: Gustav Theodor Fechner and his Psychophysical Worldview*. Trans. Cynthia Kloor. Pittsburgh: Univ. of Pittsburgh Press.

Selections from Ernst Mach. *The Science of Mechanics: A Critical and Historical Account of its Development*. Translated by Thomas J. McCormack. 6th with additions through the 9th German ed. ed. LaSalle, Ill.: Open Court Publ., 1960, pp. 541-560, 577-615.

Selections from J.B. Stallo. *The Concepts and Theories of Modern Physics*, The International Science Series. London: Kegan Paul Trench & Co., 1882.

Week 6: Oct. 9

Descriptionism, Statistics and the Social Sciences

Theodore M. Porter. "From Quetelet to Maxwell: Social Statistics and the Origins of Statistical Physics." In *Natural Sciences and the Social Sciences*, edited by I. Bernard Cohen, 345-362. Dordrecht: Kluwer Academic, 1994.

Selections from Karl Pearson. *The Grammar of Science*. London/New York: Walter Scott/Charles Scribner's Sons, 1892.

Theodore M. Porter. "The Death of the Object: Fin de Siècle Philosophy of Physics." In *Modernist Impulses in the Human Sciences, 1870-1930*, edited by Dorothy Ross, 128-151. Baltimore: Johns Hopkins Univ. Press, 1994.

Week 7: Oct. 16

Project Discussions

Week 8: Oct. 23

Natural and Cultural Peoples

Selections from Andrew Zimmerman. *Anthropology and Antihumanism in Imperial Germany*. Chicago: Univ. of Chicago Press, 2001.

Selections from H. Glenn Penny. *Objects of Culture: Ethnology and Ethnographic Museums in Imperial Germany*. Chapel Hill: Univ. of North Carolina Press, 2001.

Week 9: Oct. 30

Physics and Anthropology: Franz Boas and the Concept of Culture

Selections from Franz Boas. 1974. *The Shaping of American Anthropology, 1883-1911: A Franz Boas Reader*, edited by George W. Stocking. New York: Basic Books.

Selections from George W. Stocking. *Race, Culture, and Evolution: Essays in the History of Anthropology* Chicago: Univ. of Chicago Press, 1982.

Week 10: Nov. 6

Physics beyond Culture: William Thomson, Max Planck and Richard Feynman on Extraterrestrial Physics

William Thomson, (Lord Kelvin). "Electrical Units of Measurement." In *Popular Lectures and Addresses, Vol. 1: Constitution of Matter*, 73-136. London/New York: Macmillan, 1889 [1883].

Max Planck. "The Unity of the Physical World Picture" and "The Place of Modern Physics in the Mechanical View of Nature." In *A Survey of Physical Theory*, 1-26 and 27-44. New York: Dover, 1960 [1909 and 1910].

Selections from Richard Phillips Feynman, Robert B. Leighton, and Matthew L. Sands. *The Feynman Lectures on Physics*, Vol. I: *Mainly Mechanics, Radiation, and Heat*. 3 vols. Reading, MA: Addison-Wesley, 1963.

Week 11: Nov. 13

Non-Euclidean Geometries, Relativity and Cultural Relativism

Selections from Henri Poincaré. *Science and Hypothesis*. Translated by William John Greenstreet. London: Walter Scott, 1905.

Selections from Lucien Lévy-Bruhl. *How Natives Think*. Princeton, NJ: Princeton Univ. Press, 1985 [1926].

Cultures of Physics

Week 12: Nov. 20

National and Racial Physics: German Physics, Jewish Physics and National Socialism

Selections from Pierre Duhem, *German Science*. Translated by John Lyon. La Salle, IL: Open Court, 1991.

Selections from Klaus Hentschel, ed. *Physics and National Socialism: An Anthology of Primary Sources*. Basel/Boston/Berlin: Birkhäuser, 1996.

Selections from J.L. Heilbron. *The Dilemmas of an Upright Man: Max Planck and the Fortunes of German science*. With new afterword. Cambridge, MA: Harvard Univ. Press, 2000.

Week 13: Nov. 27

Physiology and the Modern Aesthetic

Robert M. Brain. *The Pulse of Modernism: Experimental Physiology and Artistic Avant-Gardes, 1840-1930*. Book ms.

Week 14: Dec. 4

Project Presentations

Week 15: Dec. 11

Current Perspectives on the Science Wars and Anthropology – Beyond Culture (Wars)?

Selections from Jay A. Labinger and Harry Collins, eds. *The One Culture?: A Conversation About Science*. Chicago: Univ. of Chicago Press, 2001.

Selections from Richard G. Fox and Barbara J. King, eds. *Anthropology Beyond Culture*: Berg, 2002.

Selected Bibliography – A Collaborative List

- Barth, Fredrik, ed. *One Discipline, Four Ways: British, German, French, and American Anthropology*. Chicago: Univ. of Chicago Press, 2005.
- Cooper, Alix. *Inventing the Indigenous: Local Knowledge and Natural History in Early Modern Europe*. Cambridge/New York: Cambridge Univ. Press, 2007.
- Daston, Lorraine and Peter Galison. *Objectivity*. New York/Cambridge, MA: Zone Books, 2007.
- Goodman, Alan H., Deborah Heath, and M. Susan Lindee, eds. *Genetic Nature/Culture: Anthropology and Science Beyond the Two-Culture Divide*. Berkeley: Univ. of California Press, 2003.
- Pearson, Karl. *The Grammar of Science*. London/New York: Walter Scott/Charles Scribner's Sons, 1892.
- Porter, Theodore M. *Karl Pearson: The Scientific Life in a Statistical Age*. Princeton: Princeton Univ. Press, 2004.
- . *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life*. Princeton, NJ: Princeton Univ. Press, 1995.
- Shapiro, Barbara, on the culture of fact.
- Stallo, J.B. *The Concepts and Theories of Modern Physics*, The International Science Series. London: Kegan Paul Trench & Co., 1882.
- White, Paul. Thomas Huxley: *Making the Man of Science*, Cambridge Science Biographies. Cambridge/New York: Cambridge Univ. Press, 2003.

