

Comparative Scientific Traditions: From the Ancient World to the Green Revolution

A number of years ago, the fortuitous publication of several historical and anthropological studies of science in Greece, China, the Arab world, aboriginal Australia, and Micronesia, inspired me to design a course comparing western and non-western scientific traditions. But what seemed relatively straightforward several years ago, has since become anything but. In the last five years, increasingly vocal arguments -- by feminists, historians of science, social constructivists, Third World critics, and a growing number of defenders of the scientific status quo -- about the nature of scientific authority and the role of science in the rise of the west have made the design of such a course exciting indeed! It has become virtually impossible even to begin pondering what it might mean -- or might have meant -- to do science in distant times and other places without confronting controversies surrounding contemporary western definitions of science and scientific practice. Wondering about science in ancient China, the South Pacific, or even ancient Greece leads, it turns out, smack onto the battlefields of both the science wars and the culture wars! So, rather than avoiding what once upon a time might have seemed irrelevant distractions, I have decided to grab the bull by the horns and incorporate controversy into a syllabus designed with three ends in mind: 1) to introduce you to a growing body of scholarship dealing with non-Western science; 2) to open up the historiographical issues involved in identifying and exploring "science" outside the modern western paradigm; and 3) to ponder the reasons why efforts to understand science elsewhere and elsewhere have become a magnet for divisive arguments about the moral and intellectual foundations of modern life.

Students will write several short historiographical papers that will be submitted in advance of the seminar for which they were prepared, forming the basis of that seminar's discussion. Grades will be based on the quality of both the written work and performance in discussions. Books are available at Amherst Books in town.

1. Classical Roots.
2. Islam and Medieval Europe.
3. Early China.
4. Western Exceptionalism: Standard Narratives and Scientific Revolutions.
5. Empire and Colonial Agency.
6. Mappings: Imperial and Otherwise.
7. Development and Cold War.
8. Another Reason: Indian Responses.
9. Ethnomathematics, The Quantifying Spirit, and Cultures of Objectivity.
10. The Problem of Multicultural Science.

Classical Roots

•(September 20)

Geoffrey Lloyd and Nathan Sivin, *The Way and the Word: Science and Medicine in Early China and Greece* (2002).

F. Rochberg, "Introduction: The Cultures of Ancient Science," *Isis* 83(4) (1992): 547-553.

David Pingree, "Hellenophilia versus the History of Science," ditto, pp.554-563.

Heinrich von Staden, "Affinities and Elisions: Helen and Hellenocentrism," ditto, pp.578-595.

Martin Bernal, "Animadversions on the Origins of Western Science," ditto, pp.596-607.

Islam and Medieval Europe

•(September 27)

Toby Huff, *The Rise of Early Modern Science: Islam, China, and the West* (1993), Chapters 1-6.

H. Floris Cohen, Chapter Six, "The Nonemergence of Early Modern Science outside Western Europe," pp.378-417 in *The Scientific Revolution: A Historiographical Inquiry* (1994).

A. I. Sabra, "Science, Islamic," *Dictionary of the Middle Ages* (1988), ed. J. R. Strayer.

Aydin Sayili, "The Causes of the Decline of Scientific Work in Islam," Appendix II in *The Observatory in Islam and Its Place in the General History of the Observatory* (1960).

J. J. Saunders, "The Problem of Islamic Decadence," *Journal of World History* 7 (1963): 701-720.

Early China

•(October 4)

Huff, Chapters 7-Epilogue.

Joseph Needham, "Poverties and Triumphs of the Chinese Scientific Tradition," in *The Grand Titration* (1969).

Nathan Sivin, "Why the Scientific Revolution Didn't Take Place in China - Or Did It?," in *Tradition and Transformation in the Sciences* (1984).

Roger Hart, "On the Problem of Chinese Science" (1998), in *The Science Studies Reader* (1999), ed. Mario Biagioli.

Kenneth R. Stunkel, "Technology and Values in Traditional China and the West," *Comparative Civilizations Review* 23 and 24 (1991): 75-91; 58-75.

Francesca Bray, "Technics and Civilization in Late Imperial China: An Essay in the Cultural History of Technology," in *Beyond Joseph Needham: Science, Technology, and Medicine in East and Southeast Asia*, ed. Morris Low, *Osiris* 13 (1998): 11-33.

Western Exceptionalism: Standard Accounts and Scientific Revolutions

• (October 13: This is a Thursday class!)

Michael Adas, "Attributes of the Dominant: Scientific and Technological Foundations of the 'Civilizing Mission'," Chapter 4 in *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance* (1989).

Gross and Levitt, Chapter 2, "Some History and Politics: Natural Science and Its Natural Enemies," in *Higher Superstition*.

Andrew Cunningham and Perry Williams, "De-centring the 'Big Picture': The Origins of Modern Science and the Modern Origins of Science," *British Journal for the History of Science* 26 (1993): 407-432.

H. Floris Cohen, "The Scientific Revolution: Fifty Years in the Life of a Concept," Chapter 7 in *The Scientific Revolution*.

Science, Empire, and Colonial Agency

• (October 18)

George Basalla, "The Spread of Western Science," *Science* 156 (1967): 611.

Michael Adas, "Recovering the Agency of the Colonized: Patterns of Scientific and Technological Transfer in British India, c.1780-1940," paper presented at the Princeton Workshop in the History of Science, October, 1998.

James McClellan, "Colonialism and Science in the Old Regime," *ibid.*

Paolo Palladino and Michael Worboys, "Science and Imperialism," *Isis* 84 (1993): 91-102.

Lewis Pyenson, "Cultural Imperialism and Exact Sciences Revisited," *ibid.*, pp.103-108.

Lucile Brockway, "Kew and Cinchona," in *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens* (1979).

Bruce Hunt, "Doing Science in a Global Empire: Cable Telegraphy and Electrical Physics in Victorian Britain," in *Victorian Science in Context* (1997), ed. B. Lightman.

David Wade Chambers, "Locality in the History of Science: Colonial Science, Technoscience, and Indigenous Knowledge," in *Nature and Empire: Science and the Colonial Enterprise*, ed. Roy MacLeod, *Osiris* 15 (2001): 221-240.

Mappings: Imperial and Otherwise

- (October 25)

Matthew Edney, *Mapping an Empire: The Geographical Construction of British India, 1765-1843* (1990), Chapters 1-5.

J. B. Harley, "Maps, Knowledge, and Power," in *The Iconography of Landscape* (1988), ed. D. Cosgrove and S. Daniels.

- (November 1)

Edney, *Mapping an Empire*, Chapters 6-10.

Damon Salesa, "Finding and Forgetting the Way: Navigation and Knowledge in Samoa and Polynesia," paper presented to the Princeton Workshop in the History of Science, February 13, 2004, personal copy.

John Law, "On the Methods of Long-distance Control: Vessels, Navigation, and the Portuguese Route to India," *Power, Action, and Belief: A New Sociology of Knowledge?* (1986).

Development and Cold War

- (November 8)

Vandana Shiva, *The Violence of the Green Revolution* (4th printing 2000).

Walter Rostow, "The Five Stages of Growth - A Summary," Chapter 2 in *The Stages of Economic Growth: A Non-Communist Manifesto* (1960).

W. Wayt Gibbs, "Lost Science in the Third World," *Scientific American* (August 1995): 92-99.

Sigrid Schmaltzer, "Breeding a Better China: Pigs, Practices, and Place in a Chinese County, 1929-1937," *The Geographical Review* 92(1) (2002): 1-22.

Deepak Kumar, "Reconstructing India: Disunity in the Science and Technology for Development Discourse, 1900-1947," in *Nature and Empire: Science and the Colonial Enterprise*, ed. Roy MacLeod, *Osiris* 15 (2001): 241-257.

Peter Neushul and Lawrence Badash, "Harvesting the Pacific: The Blue Revolution in China and the Philippines," in *Beyond Joseph Needham: Science, Technology, and Medicine in East and Southeast Asia*, ed. Morris Low, *Osiris* 13 (1998): 186-209.

Another Reason: Indian Responses

- (November 15)

Gyan Prakash, *Another Reason: Science and the Imagination of Modern India* (1999).

Jatinder K. Bajaj, "Francis Bacon, the First Philosopher of Modern Science: A Non-Western View," in Ashis Nandy, ed., *Science, Hegemony and Violence: A Requiem for Modernity* (1988).

S. Sangwan, "Why Did the Scientific Revolution Not Take Place in India?" in *Science and Empire* (1991), ed. Deepak Kumar.

Gross and Levitt, "The Gates of Eden," in *Higher Superstition*.

Meera Nanda, "The Science Wars in India," *Dissent* 44(1) (1997): 78-83.

Thomas Ewbank, "The World a Workshop" (1855), in Thomas Hughes, *Changing Attitudes Toward American Technology*.

•(TBA: Monday is Thursday this week!)

Prakash, Another Reason.

Ethnomathematics, The Quantifying Spirit, and Cultures of Objectivity

•(November 29)

Helen Watson-Verran and David Turnbull, "Science and Other Indigenous Knowledge Systems," in *Handbook of Science and Technology Studies* (1995), ed. Sheila Jasanoff, Gerald Markle, James C. Petersen, and Trevor Pinch.

Helen Verran, "Logic and Mathematics: Challenges Arising in Working Across Cultures," in *Mathematics Across Cultures* (2000), ed. Helaine Selin.

Jean Lowe, "The Values of Quantification," in *Power, Action and Belief* (1986).

Ted Porter, "Cultures of Objectivity," in *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (1995).

M. Norton Wise, "Introduction," "Part I - Traveling," "Part II - The Age of Steam and Telegraphy," "Part III - 'Today Precision Must Be Commonplace'," in *The Values of Precision* (1995), ed. M. Norton Wise.

Lorraine Daston, "Objectivity and the Escape from Perspective," *Social Studies of Science* 22 (1992): 597-618.

David Landes, "The Greatest Necessity of Every Rank of Men," Chapter 4 in *Revolution in Time: Clocks and the Making of the Modern World* (1983).

The Problem of Multicultural Science

•(December 6)

Sandra Harding, Chapters 1-8, *Is Science Multicultural: Postcolonialisms, Feminisms, and Epistemologies* (1998).

Paul Gross and Norman Levitt, Chapter One, "The Academic Left and Science," *Higher Superstition* (1994).

Norton Wise, "The Enemy Without. The Enemy Within: A Review of Gross and Levitt, *Higher Superstition*" *Isis* 87 (1996).

Liz McMillen, "The Science Wars Flare at the Institute for Advance Study," *Chronicle of Higher Education*, May 16, 1997, A13.

Mario Bunge, "In Praise of Intolerance to Charlatanism in Academia," in *The Flight from Science and Reason* (1996), ed. Paul Gross, Norman Levitt, and Martin Lewis.

• (December 13)

Sandra Harding, Chapters 9-11, *Is Science Multicultural?*

Gross and Levitt, "Does It Matter?", concluding chapter in *Higher Superstition*.

Ian Hacking, "The Disunities of the Sciences," in *The Disunity of Science: Boundaries, Contexts, and Power* (1996), ed. Peter Galison and David Stump.

Dorothy Nelkin, "The Science Wars: Responses to a Marriage Failed," in *Science Wars* (1996), ed. Andrew Ross.

Paul Gross, "Introduction," in Gross, Levitt, and Lewis, eds., *The Flight from Science and Reason*.

David Turnbull, "Rationality and the Disunity of the Sciences," in *Mathematics Across Cultures: The History of Non-Western Mathematics* (2000), ed. Helaine Selin.

Resources

The place to begin is with the recent bibliographic works of Helaine Selin: *Science across Cultures : An Annotated Bibliography of Books on Non-Western Science, Technology, and Medicine* (1992); Selin and Xiaochun Sun, *Astronomy across Cultures : The History of Non-Western Astronomy* (2000); Selin, *Mathematics across Cultures : The History of Non-Western Mathematics* (2000); and Selin, *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures* (1997). For China, of course, there is the epic, multi-volumed, and on-going *Science and Civilization in China*, initiated by Joseph Needham in 1954. The *History of Science Society* annual has two recent volumes devoted to relevant topics: *Nature and Empire: Science and the Colonial Enterprise*, ed. Roy MacLeod, *Osiris* 15 (2001); and *Beyond Joeseph Needham: Science, Technology, and Medicine in East and Southeast Asia*, ed. Morris Low, *Osiris* 13 (1998). And not to be overlooked is the annual *Isis Current Bibliography* which offers impressive and easily searched coverage of relevant publications. For the price of membership to the Society, one can gain access to the on-line version of this essential database.

Bibliography

(This is a somewhat idiosyncratic list and very much a work in progress!)

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- Aveni, Anthony. *Skywatchers of Ancient Mexico*, 1980.
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- Black, Cyril, et al. *The Modernization of Japan and Russia: A Comparative Study*. London, 1976.
- Bray, Francesca. "Eloge [for Joseph Needham]." *Isis* 87 (1996): 312-16.
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