HH1004: Science and Technology in Historical Perspective (2017-2018, SEM 1)

Instructor & Tutor: Asst Prof Park Hyung Wook (hwpark@ntu.edu.sg) / 6592-3565 / HSS-05-14

Learning Objective:

This is a thematic survey in the history of science and technology, focusing on the modern period after the seventeenth century. Students are expected to explore diverse historical problems in science and technology in the global and local contexts. Through this course, students will understand the importance of science and technology in creating modernity in both Western and Asian societies. In particular, students in the humanities and social sciences will be able to understand that science and technology are not on the opposite side of the world of emotions, entertainments, and cultures. They will see that science and technology are for ordinary citizens, who need to be actively engaged in constructing, interpreting, and using science and technology.

Course Structure:

2 Hour Weekly Lecture + 1 Hour Weekly Tutorial

Assignment and Evaluation:

Lecture Attendance and Quiz (15%)

Lecture Participation (5%)

Midterm Essay (15%)

Tutorial Activity (15%)

Final Exam (50%)

Lecture and Tutorial Schedule and Readings:

1) Introduction & Natural Knowledge in the Past
   Lecture: Peter Bowler and Iwan Morus, *Making Modern Science* (Chicago: University of Chicago Press, 2005), pp. 1-4. (Some articles related to ancient science and technology can be found in the "Further Readings" section in the courseweb in NTULearn.)

2) Scientific Revolution
   Lecture: Andrew Ede and Lesley Cormack, *A History of Science in Society*, Volume II (New York: Broadview Press, 2004), pp. 11-47.
   Tutorial: Peter Dear, "*Totius in verba*: Rhetoric and Authority in the Early Royal Society," *Isis* 76 (1985), pp. 145-161.

3) Imperial China and "Why Not" Questions

Lecture: James E. McClellan and Harold Dorn, *Science and Technology in World History* (Baltimore: Johns Hopkins University Press, 2006), pp. 117-140.

Tutorial: Benjamin Elman, "Jesuit *Scientia* and Natural Studies in Late Imperial China, 1600-1800," *Journal of Early Modern History* 6 (2002), pp. 209-232.

4) Industrial Revolution

Lecture: McClellan and Dorn, *Science and Technology in World History*, pp. 279-294.

Tutorial: Thomas Misa, *Leonardo to the Internet* (Baltimore: Johns Hopkins University Press, 2011), 59-96.

5) Darwinism

Lecture: Ede and Cormack, *A History of Science in Society*, pp. 91-112.

Tutorial: Paul Weindling, "Genetics, Eugenics, and the Holocaust," in Denis Alexander and Ronald Numbers (eds.), *Biology and Ideology from Descartes to Dawkins* (Chicago: University of Chicago Press, 2010), pp. 192-214.

6) Imperialism, India, and Technologies

Lecture: Misa, *Leonardo to the Internet*, pp. 97-127.

Tutorial: David Arnold, *Science, Technology, and Medicine in Colonial India* (Cambridge: Cambridge University Press, 2000), pp. 2-9, 92-128, 169-176.

7) Second Industrial Revolution

Lecture: Misa, *Leonardo to the Internet*, pp. 128-150, 158-167.

Tutorial: Amy Bix, *Inventing Ourselves Out of Jobs?* (Baltimore: Johns Hopkins University Press, 2000), pp. 9-42.

8) From Destruction to Communication

Lecture: Misa, *Leonardo to the Internet*, pp. 190-224.

Tutorial: Timothy Stoneman, "A Bold New Vision: The VOA Radio Ring Plan and Global Broadcasting in the Early Cold War," *Technology and Culture* 50 (2009), pp. 316-344.

9) Science, Technology, and Communism

Lecture: Loren Graham, *Science in Russia and the Soviet Union* (Cambridge: Cambridge University Press, 1993), pp. 79-98, 173-190.

Tutorial: Kirill Rossianov, "Editing Nature: Joseph Stalin and the 'New' Soviet Biology," *Isis* 84 (1993), pp. 728-745.

10) Case of Japanese Technology and Science

Lecture: Tessa Morris-Suzuki, *The Technological Transformation of Japan* (Cambridge: Cambridge University Press, 1994), pp. 13-54.

Tutorial: Gregory Clancey, "Foreign Knowledge: Cultures of Western Science-Making in Meiji Japan," *Historia Scientiarum* 11 (2002), pp. 245-260.

11) Science and Religion

Lecture: Bowler and Morus, *Making Modern Science*, pp. 341-366.

Tutorial: Ronald Numbers, "Creationism, Intelligent Design, and Modern Biology," in *Biology and Ideology*, pp. 302-328.

12) Science, Technology, and Gender

Lecture: Bowler and Morus, *Making Modern Science*, pp. 487-509.

Tutorial: Ruth Cowan, *More Work for Mother: The Ironies of Household Technology* (New York: Basic Books, 1985), pp. 3-15, 192-216.

13) Popular Science

Lecture: Bowler and Morus, *Making Modern Science*, pp. 367-390.

Tutorial: Gregg Mitman, "Cinematic Nature: Hollywood Technology, Popular Culture, and the American Museum of Natural History," *Isis* 84 (1993), 637-661.

Midterm Essay:

The professor will assign a topic in the form of a question during the lecture. Students are expected to write an essay about it using course readings and other resources available, including "further readings." The content of the paper must answer the question with approximately 1,000 words, excluding footnotes and bibliography. The recommended style of the essay can be found in Chicago Manual of Style (available in the NTU Library). You should submit your paper to the course website of NTULearn. After logging on, please click "Midterm Assignment." Please be on time. Any late submission, along with overly long or short papers, may be subject to penalty. Please submit your file in the doc (MS word) format rather than the pdf format.

What You Should Do during Lectures:

There will be a quiz during every lecture. This will also be used for monitoring attendance. Even if you do not choose the correct answer for the quiz, your attendance in the lecture will still be acknowledged. But getting the right answer will let you earn extra marks. To do so, you need to finish the assigned reading for each week before coming to the lecture hall. Please do not forget to bring your clicker device which will enable you to answer the quiz. In addition, the professor will occasionally ask questions amid the lecture. You are encouraged to answer these questions and ask your own to earn credit for your "lecture participation" (5%).

Tutorials:

There are three tutorial sessions, and you need to attend just one. During the class, tutors will interact with students to talk about a paper for your better understanding of the week's subject. You are encouraged to be active during the tutorials, since your attendance and activity will be monitored and will contribute to your marks (15% of the total).

Final Exam:

There will be 12 questions reflecting the twelve weeks of lecture (except the first week' class). You will have to write down a short analytic essay (2-3 paragraphs) for each question. At least one question will be about images in the lecture/tutorial readings. This is a closed book exam.

How to Find Readings:

All readings' pdf files are available in the course's webpage within NTULearn. Please log on with your ID and password to gain an access to the course's webpage. Then click "Lecture Readings" or "Tutorial Readings." In NTULearn, there are "Further Readings" recommended for your deeper study. Many of these are available in pdf file format. In HSS libraries' course reserve collection, you can also find most of the books in the syllabus. Pick up these books, if you want to study more.

Plagiarism:

Plagiarism is a serious academic misconduct and may endanger a student's career in a highly severe way. It is done intentionally or unintentionally using another person's ideas and writings without any proper citation and/or quotation marks. Collusion, which may involve a close collaboration in completing an assignment, is another problem. Unless instructed otherwise, your midterm assignment should be done by yourself alone. Paraphrasing is an act of rewriting other people's ideas or arguments using your own words. While this is an acceptable practice in most cases, it can be an issue if you do not indicate that the ideas have come from another person's works. If you are not sure about how you should do regarding these issues, please do cite the referred sources in footnotes/endnotes and use the quotation marks around the terms you did not originally write. Even if you cited the source, your paper can be a problem without the proper use of quotation marks. If any plagiarized sentence or paragraph is detected, the grade will be reduced to zero.

Further Readings:

These are for your further study if you are particularly interested in any of the subjects in the class. You can also use them for writing your midterm essay. Most of the papers in the list are found in the courseweb of NTULearn, and the books in this list can be checked out from the NTU Libraries (mostly HSS Library). The professor can occasionally mention the content of the further readings during the lecture, and will let students know in which books or papers they can find it.

1) **Introduction & Natural Knowledge in the Past**
   Martin Bernal, "Animadversions on the Origins of Western Science," Isis 83 (1992), pp. 596-607.
   McClellan and Dorn, *Science and Technology in World History*, chapters 2, 3, 5, 6.
   David C. Lindberg, *The Beginnings of Western Science* (Chicago: University of Chicago Press, 2007).

2) **Scientific Revolution**
   Mario Biagioli, "Galileo the Emblem Maker," *Isis* 81 (1990), pp. 230-258.
   Steven Shapin, "The Invisible Technician," *American Scientist* 77 (1989), pp. 554-563.
   ----------. "The House of Experiment in Seventeenth-Century England," *Isis* 79 (1988), pp. 373-404.
   Katharine Park and Lorraine J. Daston, "Unnatural Conceptions: The Study of Monsters in Sixteenth- and Seventeenth-Century France and England," *Past and Present* 92 (1981), pp. 20-54.

Frances A. Yates, "The Hermetic Tradition in Renaissance Science," in Charles Singleton (ed.), *Art, Science, and History in the Renaissance* (Johns Hopkins University Press, 1968), pp. 255-274.

Harry Collins and Trevor Pinch, *The Golem: What Everyone Should Know about Science* (Cambridge: Cambridge University Press, 1993).

Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 2012).

3) **Imperial China and "Why Not" Questions**

Yung Sik Kim, "Natural Knowledge in Traditional Culture: Problems in the Study of the History of Chinese Science," *Minerva* 20 (1982), pp. 83-104.

Francesca Bray, "Technics and Civilization in Late Imperial China," *Osiris* 13 (1998), pp. 11-33.

Benjamin Elman, "Naval Warfare and the Refraction of China's Self-Strengthening Reforms into Scientific and Technological Failure, 1865-1895," *Modern Asian Studies* 38 (2004), pp. 283-326.

Joseph Needham, *Science in Traditional China* (Cambridge, Mass.: Harvard University Press, 1981).

G. E. R. Lloyd and Nathan Sivin, *The Way and the Word: Science and Medicine in Early China and Greece* (New Haven: Yale University Press, 2002).

4) **Industrial Revolution**

Arnold Thackray, "Natural Knowledge in Cultural Context: The Manchester Model," *American Historical Review* 80 (1974), pp. 672-709.

Robert Allen, Jean-Pascal Bassino, Debin Ma, Christine Moll-Murata, Jan Luiten Van Zanden, "Wages, Prices, and Living Standards in China, 1738-1925: in Comparison with Europe, Japan, and India," *Economic History Review* 64 (2011), pp. 8-38.

Robert Allen, "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War," *Explorations in Economic History* 38 (2001), pp. 411-447.

Charles Gillispie, "The Natural History of Industry," *Isis* 48 (1957), pp. 398-407.

Stanley Engerman, "The Standard of Living Debate in International Perspective: Measures and Indicators," *Health and Welfare during Industrialization*, ed. Richard Steckel and Roderick Floud (Chicago: University of Chicago Press, 1997), pp. 17-46.

Eric Hobsbawm, *Industry and Empire* (London: Weidenfield, 1969).

5) **Darwinism**

Bowler and Morus, *Making Modern Science*, pp. 415-438.

McClellan and Dorn, *Science and Technology in World History*, chapter 16.

Sadiah Quaresh, "Displaying Sarah Baartman, the 'Hottentot Venus,'" *History of Science* 62 (2004), pp. 233-257.

Peter J. Bowler, *Evolution: The History of an Idea* (Berkeley: University of California Press, 2003).

6) **Imperialism, India, and Technologies**

Mark Harrison, "Science and the British Empire," *Isis* 96 (2005), pp. 56-63.

Daniel Headrick, *The Tentacles of Progress: Technology Transfer in the Age of Imperialism, 1850-1940* (Oxford: Oxford University Press, 1988), pp. 171-208, 209-258.

Daniel Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (Oxford: Oxford University Press, 1981).

Gyan Prakash, *Another Reason: Science and the Imagination of Modern India* (Princeton: Princeton University Press, 1999), pp. 3-14, 17-48.

Shruti Kapila, "The Enchantment of Science in India," *Isis* 101 (2010), pp. 120-132.

J. I. Hans Bakker, "The Gandhian Approach to Swadesh or Appropriate Technology: A Conceptualization in Terms of Basic Needs and Equity," *Journal of Agricultural Ethics* 3 (1990), pp. 50-88.

David Arnold, *The Tropics and the Traveling Gaze: India, Landscape, and Science, 1800-1856* (Seattle: University of Washington Press, 2006).

Deepak Kumar and Raj Sekhar Basu (eds.), *Medical Encounters in British India* (Oxford: Oxford University Press, 2013).

7) **Second Industrial Revolution**

George Wise, "A New Role for Professional Scientists in Industry," *Technology and Culture* 21 (1980), pp. 408-429.

Augustin Cerveaux, "Taming the Microworld: DuPont and the Interwar Rise of Fundamental Industrial Reearch," *Technology and Culture* 54 (2013), pp. 262-288.

Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm* (Chicago: University of Chicago Press, 2004).

8) **From Destruction to Communication**

Susan J. Douglas, *Inventing American Broadcasting, 1899-1922* (Baltimore: Johns Hopkins University Press, 1987).

Ross Bassett, "Aligning India in the Cold War Era: Indian Technical Elites, the Indian Institute of Technology at Kanpur, and Computing in India and the United States," *Technology and Culture* 50 (2009), pp. 783-810.

Thomas P. Hughes, *Rescuing Prometheus* (New York: Pantheon Books, 1998).

Agatha C. Hughes and Thomas P. Hughes (eds.), *Systems, Experts, and Computers: The Systems Approach in Management and Engineering, World War II and After* (Cambridge, Mass.: MIT Press, 2000).

9) **Science, Technology, and Communism**

Li Peishan, "Genetics in China: The Qingdao Symposium of 1956," *Isis* 79 (1988), pp. 227-236.

Slava Gerovitch, "Stalin's Rocket Designers' Leap into Space: The Technical Intelligentsia Faces the Thaw," *Osiris* 23 (2008), pp. 189-209.

Nils Roll-Hansen, "Wishful Science: The Persistence of T. D. Lysenko's Agrobiology in the Politics of Science," *Osiris* 23 (2008), pp. 166-188.

Alexei Kojevnikov, "President of Stalin's Academy: The Mask and Responsibility of Sergei Vavilov," *Isis* 87 (1996), pp. 18-50.

David Joravsky, *The Lysenko Affair* (Cambridge, Mass.: Harvard University Press, 1970).

10) **Case of Japanese Technology and Science**

Steven Ericson, "Importing Locomotives in Meiji Japan: International Business and Technology Transfer in the Railroad Industry," *Osiris* 13 (1998), pp. 129-153.

Eikoh Shimao, "The Reception of Lavoisier's Chemistry in Japan," *Isis* 63 (1972), pp. 308-320.

Graeme J. N. Gooday and Morris E Low, "Technology Transfer and Cultural Exchange: Western Scientists and Engineers Encounter Late Tokugawa and Meiji Japan," *Osiris* 13 (1998), pp. 99-128.

James Bartholomew, "Japanese Nobel Candidates in the First Half of the Twentieth Century," *Osiris* 13 (1998), pp. 238-284.

----------. *The Formation of Science in Japan* (New Haven: Yale University Press, 1993).

11) **Science and Religion**

A. I. Sabra, "The Appropriation and Subsequent Naturalization of Greek Science in Medieval Islam," *History of Science* 25 (1987), pp. 223-243.

George Ovitt, Jr., "The Cultural Context of Western Technology: Early Christian Attitude toward Manual Labor," *Technology and Culture* 27 (1986), pp. 477-500.

Peter Dear, "Miracles, Experiments, and the Ordinary Course of Nature," *Isis* 81 (1990), pp. 663-683.

David Lindberg and Ronald Numbers (eds.), *When Science and Christianity Met* (Chicago: University of Chicago Press, 2003).

Ronald Numbers, *The Creationists: From Scientific Creationism to Intelligent Design* (Cambridge, Mass.: Harvard University Press, 2006).

Robert T. Pennock (ed.), *Intelligent Design, Creationism, and Its Critics: Philosophical, Theological, and Scientific Perspectives* (Cambridge, Mass.: MIT Press, 2001).

12) **Science, Technology, and Gender**

Emily Martin, "The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles," *Journal of Women in Culture and Society* 16 (1991), pp. 323-339.

Margaret W. Rossiter, "'Women's Work' in Science, 1880-1910," *Isis* 71 (1980), pp. 381-398.

----------. *Women Scientists in America: Struggles and Strategies to 1940* (Baltimore: Johns Hopkins University Press, 1984).

Evelyn Fox Keller, "Anomaly of a Woman in Physics," *Women, Science, and Technology: A Reader in Feminist Science Studies*, ed. Mary Wyer, et al (New York: Routledge, 2001), pp. 9-16.

----------. *A Feeling for the Organism: The Life and Work of Barbara McClintock* (New York: Freeman, 1983).

13) **Popular Science**

Sally Gregory Kohlstedt, "Parlors, Primers, and Public Schooling: Education for Science in Nineteenth-Century America," *Isis* 81 (1990), pp. 424-445.

Ian Hacking, "Telepathy: Origins of Randomization in Experimental Design," *Isis* 79 (1988), pp. 427-451.

James Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of Vestiges of the Natural History of Creation* (Chicago: University of Chicago Press, 2000).

C. P. Snow, *The Two Cultures* (Cambridge: Cambridge University Press, 1998).

Edward James and Farah Mendlesohn, *The Cambridge Companion to Science Fiction* (Cambridge: Cambridge University Press, 2013).