



## ILS 202: Western Culture: Science, Technology, Philosophy II Hist Sci 202: Making Modern Science Spring 2019

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Office Hours: F 9:45-11:45

Class meets:  
MW 09:55-10:45am  
Mosse 2650

**TAs:** James Barnes (**ILS 202**); Monica Ledesma, Paul Stein, Patrick Walsh (**Hist Sci 202**).

**Welcome to Making Modern Science!** Considered as a professional activity, science and technology are relatively recent products of Western European culture. In this course, we will examine developments since the mid-seventeenth century that have brought about a dramatic change in the way we understand the world and our place in it. How can we best explain why the thing we call science began when and where it did? What forces formed it, and how - in turn - has it become a powerful agent in shaping modern life? Tackling these questions is a major historical challenge, one that will take us from the familiar and the local to the furthest extent of distant empires. We will not find all the answers. But we will learn a lot about the connections between commerce, manufacture, exploration, and war, changing conceptions of man's place in nature, and our ability to control the world around us. And, in the process, we will come to a new understanding of the relationship between science, technology and society.

This course is suitable for undergraduates in any field. No previous knowledge is required: historical background will be provided, and key scientific concepts explained, by the lectures and readings.

**Important Information about ILS 202:** By enrolling in ILS 202, you will earn *natural sciences* credit. This means that your discussion sections will focus on developing your understanding of the *scientific concepts* covered by this course, and that the assessed work you do will require you to demonstrate this understanding. This does not mean that you will be tested on equations and math. But it does mean that your work for this course should include comprehending *key features of the science* we discuss.

**Important Information about Hist Sci 202:** By enrolling in Hist Sci 202, you will earn *humanities* credit. This means that your discussion sections will focus on developing your *historical* understanding of the science covered by this course, and that the assessed work you do will require you to demonstrate this understanding. This does not mean that the science you know is irrelevant. But it does mean that

your work for this course should focus on learning about the science we discuss in its own *historical context*.

## Credit Policy

This **3-credit** class meets for three 50-minute class period each week over the spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc.) for about 2 hours out of classroom for every class period. The syllabus includes additional information about meeting times and expectations for student work.

## Learning Objectives:

By the end of this course you should:

- understand why and how science has become such a powerful component of modern culture;
- **(key for ILS 202)** be able to outline some key changes in human understanding of the natural world since the 17<sup>th</sup> century: how these were set in motion, why they mattered and what were their consequences;
- **(key for Hist Sci 202)** appreciate science as a contingent activity, as profoundly shaped by its context as it is effective in controlling and manipulating the material world;
- know that history (of science) can serve a range of goals, depending on the questions it seeks to answer and the audiences it is intended to address.

This course will also help you develop transferable skills in:

- analyzing and criticizing written argument (readings);
- evaluating and synthesizing information derived from a range of sources (reading, lectures, and informal discussions);
- constructing and defending written and verbal arguments (your contributions in the classroom, and your written work)

You will also gain experience in:

- planning and executing small-scale projects (historical exercises, short essay writing);
- working with others (participation in classroom exercises);
- interpreting historical sources (reading the primary and secondary literature)

## Assessment:

- 20%: Attendance and participation, including any informal writing, homework exercises, and other discussion activities. This portion of your grade reflects attendance and participation in lectures as well as in discussion (reported by your TA).
- 30%: equally allocated to three historical exercises, due in your 202 L@UW Dropbox by 7 pm on the following days: **Wednesday, February 13; Monday, March 4; Wednesday, April 3**
- 15%: Completion of a short, written quiz (multiple choice) on each of 6 topics (as listed in this syllabus; 2.5% per quiz; 10 questions per quiz). These tests will take place at the start of the **first lecture of topics 2 through 6 and the final review lecture.**
- 15%: mid-semester test, to be held in class on **Wednesday, April 17 2019**. This 1-hour blue book exam will require you to answer 3 out of 5 short answer questions.
- 20%: Take-home essay (1000 words), due on Learn@UW by 3pm on **Friday, May 10 2019**. Late papers will not be accepted.

All formal writings should be at least 1.5 spaced and supplied as WORD files (not PDFs). See “Introductory Study Materials” on Learn@UW for details on policies concerning late papers, plagiarism, learning accommodations, and academic performance.

## Grading:

This course is graded according to UW Madison’s standard grade boundaries:

A = 95-100% = 4.0 GPA

AB = 90-94% = 3.5 GPA

B = 85%-89% = 3.0 GPA and so forth.

## Plagiarism and Scholarly Integrity:

It is your responsibility to avoid plagiarism. In the first instance, you are directed to the University of Wisconsin guidelines concerning plagiarism and scholarly integrity. If you are unclear in any specific instance, please ask for advice. Your TA and I will be happy to help you.

## Course Textbook:

No textbook is required for this course. But if you would like to have an independent framework for the material we’ll be studying, I suggest:

Peter Bowler and Iwan Morus, *Making Modern Science: A Historical Survey* (Chicago, 2005)

## Course Schedule:

*Introduction: where you will learn what the course entails, and how to complete it successfully.*

1. **(1/23/19) Introduction: What is modern science and where did it begin?**

**Required Reading:** None

*TOPIC 1: Natural Philosophy and the Birth of Experiment: in which we will see how new ways of thinking about and interacting with the world introduced during the Scientific Revolution improved human ability to control, predict and manipulate natural phenomena*

2. **(1/28/19) The Scientific Revolution: A very short introduction**

**Required Reading:** Steven Shapin, *The Scientific Revolution* (Chicago, 1996), Excerpt from Chapter 1, “What was known?” pp. 15-30.

3. **(1/30/19) Uniting the Heavens and the Earth: Galileo, experiment and the new science of motion**

**Required Reading:** Colin Ronan, “Galileo Galilei,” in Roy Porter, ed., *Man Masters Nature* (London, 1987), 39-50.

4. **(2/4/19) Experiment and Mechanical Philosophy: Descartes and the Clockwork Universe**

**Required Reading:** Peter Dear, *Revolutionizing the Sciences* (Macmillan, 2001), Chapter 5, “Mechanism: Descartes Builds a Universe,” pp. 80-100.

5. **(2/6/19) Newton: the paradigm of paradigms**

**Required Reading:** Rob Iliffe, *Newton: A Very Short Introduction* (Oxford, 2007), Chapter 3 “The Marvellous Years,” pp. 20-40.

*TOPIC 2: Teaching, Learning and Doing Science: in which we trace the institutionalization of science and the emergence of the scientist as professional expert from the Enlightenment to the 20<sup>th</sup> century*

6. **(2/11/19) Enlightenment Science: Laplacian Physics and the Ecole Polytechnique**

**Required Reading:** Robert Fox, “Laplacian physics,” in *Companion to the History of Modern Science* edited by R. Olby, G. Cantor, J. Christie, and M. Hodge (London, 1990), pp. 278–94.

7. **(2/13/19) The Chemical Revolution**

**Required Reading:** Antoine Lavoisier, “Preface” to *Elements of Chemistry* transl. Robert Kerr (Edinburgh, 1790), xiii-xxxvii (at: <https://web.lemoyne.edu/giunta/ea/LAVPREFann.HTML> ).

8. **(2/18/19) The Rise of the Research University**

**Required Reading:** W. V. Farrar, “Science and the German University System, 1790-1850,” in *Chemistry and the Chemical Industry in the 19<sup>th</sup> Century* (Basingstoke: Macmillan, 1975), pp. 179-192.

9. **(2/20/19) Laboratory Science**

**Required Reading:** Catherine M. Jackson, “*The Laboratory*,” in *Companion to the History of Science*, ed. Bernard Lightman (Blackwell-Wiley, 2016), 296-309.

10. **(2/25/19) Popular Science**

**Required Reading:** Richard D. Altick, *The Shows of London* (Harvard, 1978) Chapter 32, “The Crystal Palace Year,” pp. 455-69.

*TOPIC 3: Science, Religion and the State: in which we explore the changing relationship between science and religion from the early 19<sup>th</sup> century onwards, including the controversy over Darwinian evolution and the appropriation of science as a tool of the modern state*

11. **(2/27/19) Science as Taxonomy**

**Required Reading:** Lisbet Koerner, “Linnaeus’ Floral Transplants,” *Representations* 47 (1994): 144-169.

12. **(3/4/19) Lyell and the Age of the Earth**

**Required Reading:** Peter Bowler and Iwan Morus, *Making Modern Science: A Historical Survey* (Chicago, 2005), Chapter 5, “The Age of the Earth,” pp. 103-27.

13. **(3/6/19) Charles Darwin and the *Origin of Species***

**Required Reading:** Charles Darwin, *Origin of Species* (London, 1859): Introduction and Conclusion.

14. **(3/11/19) The Darwinian Controversy: Huxley and Wilberforce**

**Required Reading:** John H. Brooke, “The Wilberforce-Huxley Debate: Why did it happen?” *Science & Christian Belief* 13 (2001), 127-141.

**(3/13/19) Racial Science: Eugenics and National Socialism**

**Required Reading:** Diane B. Paul, *Controlling Human Heredity: 1865 to the present* (Atlantic Highlands, NJ, 1995), Chapter 5 “Eugenic Solutions.”

**PLEASE NOTE: NO CLASSES DURING SPRING BREAK, MARCH 16-24**

15. **(3/25/19) Genetics and Genetic Medicine**

**Required Reading:** Dan Kevles, “From Eugenics to Genetic Manipulation,” in *Companion to*

*Science in the Twentieth Century*, edited by John Krige and Dominique Pestre (Routledge, 2003), pp. 301-18.

**TOPIC 4: Science and Empire: in which we learn how 19<sup>th</sup> century imperialism changed science as well as political geography**

**16. (3/27/19) Telegraphy and Empire**

**Required Reading:** Bruce J. Hunt, “Michael Faraday, Cable Telegraphy and the Rise of Field Theory,” *History of Technology* 13 (1991): 1–19.

**17. (4/1/19) The Global Quinine Trade**

**Required Reading:** <http://www.lib.cam.ac.uk/deptserv/rcs/cinchona.html>

**18. (4/3/19) Guano: Global Economy and Pacific Eco-History**

**Required Reading:** Gregory T. Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (Cambridge, UK, 2013), Excerpt from Chapter 2 “The Guano Age,” 23-38.

**TOPIC 5: Science and War: in which we use 20<sup>th</sup> century examples to examine the powerful effect of war on the development of science, technology and industry**

**19. (4/8/19) Einstein, Eddington and the Solar Eclipse Expedition**

**Required Reading:** Alistair Sponsel, “Constructing a “revolution in science”: the campaign to promote a favourable reception for the 1919 solar eclipse experiments,” *British Journal for the History of Science* 35 (2002): 439-67.

**20. (4/10/19) The Manhattan Project: how Physics became Industrial**

**Required Reading:** Michael D. Gordin, *Five Days in August: How World War II became a Nuclear War* (Princeton, 2007), 59-84 (Chapter 4: Miracle).

**21. (4/15/19) Cold War Science**

**Required Reading:** Jon Agar, *Science in the 20th Century and Beyond* (London, 2013), Excerpt from Chapter 13 “Trials of Science in the Atomic Age,” pp. 308-16.

**MID-SEMESTER TEST**

**22. (4/17/19) Mid-Semester Test covering Topics 1-5**

**TOPIC 6: Science and Industry, Health and Environment: beginning with the Industrial Revolution, we track the rise of major industries and emerging 20<sup>th</sup> and 21<sup>st</sup> century concerns including climate change and genetically modified organisms**

23. **(4/22/19) Science and Industry: the Case of Penicillin**

**Required Reading:** Robert Bud, *Penicillin: Triumph and Tragedy* (Oxford, 2007), Excerpts from Chapter 2.

24. **(4/24/19) Agriculture and the Environment**

**Required Reading:** Rachel Carson, *Silent Spring, 40<sup>th</sup> Anniversary Edition* (New York, 2002), Chapter 12, “The Human Price.”

25. **(4/29/19) Climate Change and Green Energy**

**Required Reading:** Naomi Oreskes and Erik Conway, *Merchants of Doubt* (London, 2010), Chapter 6 “The Denial of Global Warming.”

*Review: in which we draw out the major themes and developments discussed during the course*

26. **(5/1/19) Course Review and Essay Clinic**