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 17th 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 3 pm 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:

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**
      

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

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

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

   **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 20th century.

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

   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/ca/LAVPREFann.HTML](https://web.lemoyne.edu/giunta/ca/LAVPREFann.HTML)).
8. (2/18/19) The Rise of the Research University

9. (2/20/19) Laboratory Science

10. (2/25/19) Popular Science

**TOPIC 3: Science, Religion and the State:** in which we explore the changing relationship between science and religion from the early 19th 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

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

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


    (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

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

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


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

*Required Reading:* [http://www.lib.cam.ac.uk/deptserv/res/cinchona.html](http://www.lib.cam.ac.uk/deptserv/res/cinchona.html)

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


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


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


**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 20th and 21st century concerns including climate change and genetically modified organisms**
23. (4/22/19) Science and Industry: the Case of Penicillin


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


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


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

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