History of Science 202: The Making of Modern Science /
Integrated Liberal Studies 202: Science, Technology, Philosophy II

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Office hours: 4120 Mosse Humanities, M 11AM-1PM

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MW 9:55AM-10:45AM
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Introduction

Welcome to Making Modern Science! Considered as a professional activity, what we now understand as science is a relatively recent product of human 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, industry, exploration, and war, changing conceptions of humankind'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.

Learning Objectives

This course is designed to help you achieve a variety of goals related both to historical content and transferable skills.

In terms of content, you will learn to:

– understand key concepts of modern science and how they came into being.
– evaluate science as a human activity, shaped by its social and cultural contexts.

– appreciate how our understanding of science continues to transform the world today.

In terms of skills, you will learn to:

– interpret, analyze, criticize, and tell stories with diverse kinds of sources.
– empathize with viewpoints that are radically different from your own.
– construct and defend both oral and written arguments.

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.

By enrolling in HistSci 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

Credit Policy

This 3-credit course meets as a group for 3 hours per week (according to UW-Madison's credit hour policy, each 50-minute class counts as one hour). The course also carries the expectation that you will spend an average of at least 2 hours outside of class for every hour in the classroom. In other words, in addition to class time, plan to allot an average of at least 6 hours per week for reading, writing, preparing for discussion, and/or studying for quizzes and exams for this course.

Reading

The reading for this course is focused on primary sources – historical evidence created during the period under study. This includes the writings of thinkers such as Newton, Darwin, and Einstein, as well as historical documents including maps, illustrations, letters, and articles. All primary source assignments for this course will be posted on canvas or available online.

To guide you through the primary source readings, there is also a required textbook: *Making Modern Science: A Historical Survey*, by Peter J. Bowler and Iwan Rhys Morus. Hard copies are available at A Room of One's Own Bookstore, and digital copies may be purchased or rented from the University of Chicago Press.

Assignments

10% Attendance. Coming to class earns you an automatic A for attendance. Unexcused absence will result in a lower grade.

20% Participation. You are responsible for engaging with the readings at home and with each other during section. Teaching assistants may assess participation through further assignments at their discretion.

30% Unit Quizzes (5). 10 questions, multiple choice. Brief quizzes testing basic knowledge of the material. Attendance at lecture and completion of the readings should ensure success.

40% Unit Essays (5). 3 pages double-spaced. Short essays encouraging you to synthesize your knowledge and deploy it to make an argument. No additional reading or research is required.

Accommodations

Disabilities: The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty will work either directly with the student or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Religious observances: The University of Wisconsin-Madison supports accommodation of religious observances that might conflict with the course schedule. Students must notify the instructor within the first two weeks of class of the specific days or dates on which they request relief. Make-ups may be scheduled before or after the regularly scheduled requirements. It is understood that instructors may set reasonable limits on the total number of days claimed.

Schedule

Introduction: The Making of Modern Science

Week 1
(01/22) 1. What is Modern Science?

Unit I. The Scientific Revolution (c. 1600-1700)
What is nature? How is modern science distinct from other ways of understanding the world? Why are some scientific theories more successful than others?

Week 2
(01/27) 2. A New World System

Galileo Galilei, *Dialogues Concerning Two Chief World Systems* (1632), "Author's Dedication," "To the Discerning Reader," "Second Day" (16 pp)
Making Modern Science, 23-33, 341-346

(01/29) 3. The Origins of Experiment
Francis Bacon, *New Organon* (1620), Book I, "Preface;" Aphorisms (8 pp.)
Making Modern Science, 39-45, 322-326

Week 3
(02/03) 4. Natural Philosophy
René Descartes, *Meditations* (1641), Synopsis; First Meditation; Second Meditation (16 pp.)
Making Modern Science, 33-39

(02/05) 5. The Newtonian Synthesis
Isaac Newton, *Mathematical Principles of Natural Philosophy* (1687): Definitions I-V (73-75); Scholium (77-82); Axioms I-III (83-84); General Scholium (387-393)
Making Modern Science, 46-52

Unit II. The Enlightenment (c. 1700-1800)
Is there such a thing as scientific progress? To what extent is science shaped by human cultures? What is the relationship between science and power?

Week 4

(02/10) 6. The Story of Science
Unit I Quiz in class
Marquis de Condorcet, *Sketch for a Historical Picture of the Progress of the Human Mind* (1795), table of contents, 1-20, 316-319
Making Modern Science, 1-19

(02/12) 7. Nature and Gender
Carl Linnaeus, *System of Nature* (1735), selections (10 pp.)
Making Modern Science, 132-137, 487-493

Week 5
(02/17) 8. Science and Empire
Unit I Essay due in class
William Jones, "A Discourse on the Institution of a Society" (1784), 1-9; "Second Anniversary Discourse" (1785), 10-23; "Third Anniversary Discourse" (1786), 33-36

(02/19) 9. Romantic Beginnings of Ecology
Alexander von Humboldt, *Aspects of Nature* (1808), "Preface," v-ix; "Physiognomy of Plants," 227-238, 244-246; maps, illustrations
Making Modern Science, 220-221

Unit III. The Industrial Revolution (c. 1800-1850)
What is the relationship between science and technology? How do scientific institutions take form? How does science shape daily life?

Week 6
Unit II Quiz in class
(02/24) 10. The Chemical Revolution
Antoine Lavoisier, *Elements of Chemistry* (1789), "Preface," xvii-xl, table of contents
Making Modern Science, 55-61, 67-77

(02/26) 11. The Science of Energy
"Thermo-Dynamics" (1864), 1-26.
Making Modern Science, 79-95, 407-413

Week 7
Unit II Essay due in class
(03/02) 12. Information and Communication
Alfred Russell Wallace, *The Wonderful Century*, Preface (7-9), "Modes of Travelling" (1-11), "The Conveyance of Thought" (17-23), "Estimate of Achievements" (143-156)
Making Modern Science, 391-407

(03/04) 13. The Invention of the Scientist
James Clerk Maxwell, "Introductory Lecture on Experimental Physics" (1871), 241-255
Making Modern Science, 327-339

Unit IV. The Darwinian Revolution (c. 1850-1900)
What is humanity's place in nature? Can humankind be a subject of scientific study? What is the relationship between science and religion?

Week 8
Unit III Quiz in class
(03/09) 14. The Earth Gets a History
Charles Lyell, *Principles of Geology* (1830), 1-4, 75-91
Making Modern Science, 103-126, 347-350

(03/11) 15. The Origin of Species
Charles Darwin, *The Origin of Species* (1859), Introduction, Conclusion, "Natural Selection"
Making Modern Science, 129-134, 143-154

SPRING BREAK

Week 9
Unit III Essay due in class
(03/23) 16. Religious Responses to Darwinism

Letters between Charles Darwin and Adam Sedgwick
Making Modern Science, 154-162, 354-360

(03/25) 17. Eugenics and Phrenology
Francis Galton, *Hereditary Genius* (1869), "The Comparative Worth of Different Races," 336-350
Making Modern Science, 415-434

Week 10
(03/30) 18. Psychology: The Science of the Soul
Sigmund Freud, *A General Introduction to Psychoanalysis* (1916-1917), Fifth, Sixth, and Seventh Lectures, 63-100
Making Modern Science, 299-307

(04/01) 19. Anthropology: The Science of the Human
Franz Boas, "Human Faculty as Determined by Race" (1894), 3-29
Making Modern Science, 307-315

V. Twentieth Century Science (c. 1900-1950)
How much has modern science changed since its beginnings? Has science transformed the world? What moral and ethical demands does science place upon us?

Week 11
Unit IV Quiz in class
(04/06) 20: Einstein's Universe
Albert Einstein, "What is the Theory of Relativity?" (1919) (7 pp.)
Making Modern Science, 253-270, 274-275

(04/08) 21: Nazi Science
The Secret of Tibet (1943) (film), selections
Making Modern Science, 434-436, 463-471

Week 12
Unit IV Essay due in class
(04/13) 22. The Nuclear Age
Leo Szilárd and Albert Einstein, Letter to Franklin Roosevelt (1939) (2 pp.)
Making Modern Science, 270-274, 471-484

(04/15) 23. The Space Race
John F. Kennedy, "We choose to go to the Moon" (1962) (speech), 0:00-18:15
Images from the Apollo Missions

Week 13
(04/20) 24. Climate and Environment
Rachel Carson, *Silent Spring* (1972), "The Human Price," 187-198

Making Modern Science, 213-234

(04/22) 25. The Discovery of DNA
Francis Crick, Letter to Michael Crick (1953) (7 pp.)
Making Modern Science, 189-211

Conclusion: Science Today

Week 14
(04/27) 26. Artificial Intelligence and Transhumanism
Unit V Quiz in class
Yuval Noah Harrari, *Homo Deus*, 21-49

(04/29) 27. Final Conversation: The Science of the Future
Unit V Essay due in class