

History 360W. Structure of Scientific Change

(Tu & Th 11:00-12:15, 222 McIver)

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Office hours: M & W 3:30-4:30, Tu & Th 9:30-11:00, or by appointment--
I am potentially available many other times!

Thomas Kuhn's *Structure of Scientific Revolutions*, first published in 1962, has been one of the most widely influential scholarly books of the 20th century. Its ideas about paradigms and paradigm-shifts continue to guide the thinking of people in and out of academia. Although the book was addressed to historians and philosophers of science, scholars in those fields have often been less enthusiastically accepting of Kuhn's vision than many in quite distant disciplines. In any event, the book is brim-full of important insights about science, and even its weaknesses can be used as starting points for more valid analyses. In this class we will spend several weeks getting comfortable with Kuhn's ideas and language, and then test to what extent his schema for scientific change holds up against two major conceptual revolutions in science, the change from an earth-centered to a sun-centered universe associated with the Polish astronomer Nicolas Copernicus, and the collection of changes known as the Chemical Revolution associated with the French chemist Antoine-Laurent Lavoisier. In assessing Kuhn we will also make use of several prominent critiques of his ideas.

The required books for this course are Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2nd or 3rd ed. (the 3rd. ed. is identical except for a 2-page index!) and Kuhn, *The Copernican Revolution*. Readings marked "R" are available both online and in hard copy from the Reserve Desk in Jackson Library; instructions for accessing and printing online sources are given on a separate sheet. *In some cases I have made available a longer selection than the actual assignment in case you want a little more context: be sure to check the page numbers!* You will get the most out of this class if you do the assigned readings before the corresponding class and review them after class. You are encouraged to ask questions!

The course will begin with a series of lectures designed to equip students with sufficient historical background in the history of science to be able to read Kuhn with reasonable understanding. Most classes will be a combination of lecture and discussion; I will often give out questions ahead of time to serve as foci for discussion.

There will be one exam, worth one-third of the final grade,

consisting of both short-answer and essay questions. The general themes of the essay questions will be indicated in advance. Each student will also write **and revise** two 5-page **typed** essays according to the schedule spelled out below; each is worth one-third of the final grade. Only the grade on the revision counts, *but you must hand in the first version with your revision!* I will discuss the essays in more detail on September 30, at which time I will hand out a set of essay guidelines, *which I expect you to read and follow!* I will also hand out a list of typical essay topics, though you are encouraged to think up your own. *For all written work, unexcused lateness is subject to a penalty of up to a full letter grade!* In addition, there will be frequent short in-class and (maybe also) at-home writing exercises, which I will mark on a check-plus, check, check-minus basis. These, plus attendance and class participation, will also be taken into account in determining the final grade (up to a full letter grade). *Students who miss the first two classes will be dropped from the roll.* I reserve the right to drop students who have more than three absences.

Student Learning Goals

At the completion of this course, the student will be able to:

- Demonstrate a basic understanding of Kuhn's theory of scientific change.
- Be able to assess the strengths and weaknesses of Kuhn's ideas.
- Know the basic figures and issues involved in the Copernican and Chemical Revolutions.
- Analytically and critically evaluate historical evidence, especially in regards to Kuhn's theoretical ideas.
- Communicate historical and analytical ideas clearly in good English prose.

Schedule of Topics and Readings

Aug. 19: Introduction.

Aug. 21, 26, 28: Historical Background (no reading, but it will be very helpful to begin with a quick read through Kuhn) [*handout*].

Topic I: Kuhn's Image of the Nature of Science and Scientific Change

Sept. 2, 4: Kuhn, *Structure of Scientific Revolutions*, 1-51, 52-135.

Sept. 9, 11: Kuhn, *SSR*, 136-173, 174-210.

Sept. 16: Kuhn, *SSR*, 174-210.

Sept. 18: Dudley Shapere, "The Structure of Scientific Revolutions" (R); Shapere, "The Paradigm Concept" (R); *recommended*: Alan Musgrave, "Kuhn's Second Thoughts" (R). The first and third of these readings are from Gary Gutting (ed.), *Paradigms and Revolutions* (on reserve), 27-38 and 39-53.

Sept. 23: EXAM

[N.B. Some of you might like to read an essay of mine, "Possible Kuhns in the History of Science: Anomalies of Incommensurable Paradigms" (R).]

Topic II: The Copernican Revolution

Sept. 25: (Ptolemaic background): Kuhn, *Copernican Revolution*, 1-8, 25-41, 64-77, and skim the rest of Chaps. 1-3 [*handout*].

Sept. 30: (medieval and Renaissance background): Kuhn, *CR*, 100-106, 113-133; DISCUSSION OF ESSAYS [*handouts*].

Oct. 2: (Copernicus' innovation): Kuhn, *CR*, 134-144, 160-184.

Oct. 7: (implications of moving the earth): Kuhn, *CR*, 144-160, 185-209.

Oct. 9: (Kuhn vs. Kuhn): review *Structure of Scientific Revolutions*, 67-69, 79, 82-83, 154-155, and *Copernican Revolution*, 36-41, 124-133, 136-137, 139-141, 143-144, 181-184, 264-265.

Oct. 14: FALL BREAK (no class).

Oct. 16: (a second look at Kuhn's *Copernican Revolution*): Robert Westman, "Two Cultures or One?" 79-97 (R).

Oct. 21: (Was there a Copernican revolution?): I. Bernard Cohen, *Revolution in Science*, 105-125 (R; for those who may wish to consult notes and bibliography, the book is on reserve); FIRST ESSAY DUE.

Oct. 23: (Brahe and Kepler): Kuhn, *CR*, 200-219; Cohen, *Revolution in Science*, 126-133 (R); Westman, "Two Cultures or One?" 104-112 (R).

Oct. 28: (Galileo; Newton and celestial physics): Kuhn, *CR*, 219-228, 243-265; FIRST ESSAY RETURNED.

Topic III: The Chemical Revolution

- Oct. 30: (18th-century chemistry): James Conant, "Overthrow of the Phlogiston Theory," 67-74 (R); Carleton Perrin, "Research Traditions, Lavoisier, and the Chemical Revolution," 55-60 (R).
- Nov. 4: (Lavoisier's early work): Perrin, "Research Traditions," 60-74 (R); you may want to get a start on the reading for next time; FIRST REVISED ESSAY DUE.
- Nov. 6: (discovery of oxygen): Conant, "Overthrow," 74-105 (R).
- Nov. 11: (composition of air and water): Conant, "Overthrow," 105-113 (R).
- Nov. 13: (post-1785 success of the new chemistry): Perrin, "Triumph of the Antiphlogistians," 40-63 (R)
- Nov. 18: (Kuhn on the Chemical Revolution): review Kuhn, *SSR*, 10, 23, 53-56, 59-60, 69-72, 79, 82, 87, 88-89, 99-100, 107, 118, 120-123; discuss essays
- Nov. 20: (Was there a Chemical Revolution?): Perrin, "Research Traditions," 53-55 (R); Marco Beretta, *Enlightenment of Matter*, 246-258 (R; for those who may wish to decipher the footnotes by consulting the bibliography, the book is on reserve)
- Nov. 25: (nature of the Chemical Revolution): Perrin, "Research Traditions," 74-81 (R); SECOND ESSAY DUE NEXT CLASS, BUT IT WILL MAKE MY LIFE EASIER IF SOME OF YOU CAN SUBMIT THEM NOW.
- Nov. 27: THANKSGIVING (no class)
- Dec. 2: (a final estimation): Frederic Holmes, "The Boundaries of Lavoisier's Chemical Revolution," 9-21, 38-40, 46-48 (R; skim the details on 21-38, 40-46); SECOND ESSAY DUE.
- Dec. 4: Final Reflections; course evaluation administered; SECOND ESSAY RETURNED (some may not be ready to be returned till Dec. 5)
- Dec. 12 (Friday): SECOND REVISED ESSAY DUE IN MY OFFICE BY 3:30 p.m.