

History 360-01. Structure of Scientific Change (CRN: 10638)

(M & W 2:00-3:15, MHRA 1210)

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Office hours: Tu & Th 11-12 or by appointment; I am potentially available many other times! I encourage you to come see me if you're having trouble or just want to talk.

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 the extent to which his schema for scientific change holds up against two major conceptual revolutions in science, *viz.* the change from an earth-centered to a sun-centered universe associated with the "Polish" astronomer Nicolaus Copernicus (1473-1543), and the collection of changes known as the Chemical Revolution associated with the French chemist Antoine-Laurent Lavoisier (1743-1794). 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 "eR" are available online as e-Reserves via Blackboard, as described below. *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! Note that this course is both *writing intensive* (WI) and *research intensive* (RI).

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 subsequent classes will be a combination of lecture and discussion; I will often give out questions ahead of time to serve as foci for discussion.

Written work for the course consists of an exam (30% of the grade), a *revised* research paper of eight-to-ten pages (40%), four shorter exercises preliminary to the paper (5% each), and a dozen or so short in-class or take-home writing exercises based on the readings. I will read and

(usually) comment on these exercises, marking them in a check-plus, check, check-minus fashion. Your overall performance on them, in conjunction with attendance and class participation, will comprise the remaining 10% of your grade. *More than three absences are considered excessive, and may lead to your being dropped from the roll. Students who miss the first two class periods will be dropped from the roll. If you fail to submit any of the above-mentioned four shorter exercises preliminary to the research paper I will not accept your research paper!*

Research papers should be eight-to-ten double-spaced *typed* pages. They will be marked for content and style and returned to you for revision. The final grade on the paper will be that of the revised version. *Unexcused late submissions of any assignment are subject to a penalty of up to a full letter grade for that assignment. It is essential that you hand in the first version of your research paper with your revision in order to receive a grade!* Further details will be gone over in class. I will hand out a set of essay “Guidelines” that I expect you to read and follow.

I expect students to have read and understood the section of the *Policies for Students* handbook (or the equivalent on-line version at <http://academicintegrity.uncg.edu/>) relating to the UNCG Academic Integrity Policy. Submission of written work implies your acceptance of its provisions.

A few words about **Blackboard**, UNCG’s online course management system. You can access it from the UNCG homepage by clicking “Current Students” on the horizontal yellow bar, then “Blackboard” on the horizontal grey line just below it. Most of you will already have been exposed to Blackboard at one or another orientation session for incoming students. If not, you can familiarize yourself with it via the Blackboard Online Student Orientation at <http://www.uncg.edu/aas/itc/bborient/>. If you have specific problems—say with logging in or printing—you should call the Help Desk at 6-TECH (*i.e.*, 68324) on a University phone. *In order to gain access to Blackboard you will first need to have activated your student account.* If you haven’t, go to <http://blackboard.uncg.edu/webapps/login> Click on the yellow “Support” tab at top, then “Activate your accounts” under the Links at upper left, and follow the directions. What you need to know for this course is relatively simple. “Course Information” contains the syllabus (this document). “e-Reserves” is a list of all the readings, arranged alphabetically by title (including an initial “The” or “A[n]”). That’s the principal feature you’ll need for this course. “Announcements” will alert you to things like changes in the assignment or cancellation of a class--unlikely, but you should check regularly just in case.

### ***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.
- Assess the strengths and weaknesses of Kuhn’s ideas.

- Know the principal actors and basic 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.

### ***Research Goals***

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

- Distinguish primary from secondary sources.
- Identify research problems.
- Interpret primary sources (as appropriate).
- Develop a logical and persuasive argument based on appropriate sources.
- Communicate that argument in good English prose in a focused research paper.
- Know how to use a generally recognized system of citations and bibliographic entries.

### ***Schedule of Topics and Readings***

Jan. 14: Introduction [*handout*].

Jan. 16, 23: Historical Background (continued): no reading, but it will be *very* helpful to begin with a quick read through Kuhn.

[Jan. 21: MLK Holiday: no class.]

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

Jan. 28, 30: Kuhn, *The Structure of Scientific Revolutions*, 1-51, 52-135.

Feb. 4, 6: Kuhn, *SSR*, 136-173, 174-210.

Feb. 11: Kuhn, *SSR*, 174-210; Dudley Shapere, "The Structure of Scientific Revolutions" (**eR**); Shapere, "The Paradigm Concept" (**eR**); *recommended*: Alan Musgrave, "Kuhn's Second Thoughts" (**eR**). The first and third of these readings are from Gary Gutting (ed.),

*Paradigms and Revolutions* (on reserve).

Feb. 13: Buffer Day: *recommended reading*: John Horgan, “Profile: Reluctant Revolutionary” (**eR**); some of you might like to read an essay of mine (wholly optional), “Possible Kuhns in the History of Science” (**eR**). *Written assignment to be handed in*: Identify *four* possible topics for a research paper relating to Kuhn’s work. In a sentence or two for each, tell what’s at issue or why it’s interesting or significant.

Feb. 18: EXAM

Feb. 20: Presentation of some other possible “revolutions” appropriate for research papers [*handout*]. (Look ahead to the assignment due March 17.) Essay “Guidelines” and “Takehome Quiz” handed out; the latter is to be handed in at the start of the next class.

### **Topic II: The Copernican Revolution**

Feb. 25: Ptolemaic Background: Kuhn, *The Copernican Revolution*, 1-8, 25-41, 64-77, and skim the rest of Chaps. 1-3 [*handout*].

Feb. 27: Medieval and Renaissance Background: Kuhn, *CR*, 100-106, 113-133.

Mar. 3: Copernicus' Innovation: Kuhn, *CR*, 134-144, 160-184.

Mar. 5: Implications of Moving the Earth: Kuhn, *CR*, 144-160, 185-209.

[Mar. 10, 12: Spring Break: no class.]

Mar. 17: Kuhn vs. Kuhn: review *SSR*, 67-69, 79, 82-83, 154-155, and *CR*, 36-41, 124-133, 136-137, 139-141, 143-144, 181-184, 264-265. *Written assignment to be handed in*: Identify *four* possible topics for a research paper relating to subjects *other than* Kuhn or the Copernican and chemical revolutions. For each one, identify one factor that appears favorable to a Kuhnian interpretation and one that looks problematic for it.

Mar. 19: A Second Look at Kuhn’s *Copernican Revolution*: Robert Westman, “Two Cultures or One?” Pt. A, 79-97 (**eR**) [*handout*]. (*This is the last day to drop a course without penalty.*)

Mar. 24: Was There a Copernican Revolution?: I. Bernard Cohen, *Revolution in Science*, Pt. A, 105-125 (**eR**; for those who may wish to consult the bibliography, the book is on reserve).

Mar. 26: Brahe and Kepler: Kuhn, *CR*, 200-219; Cohen, *Revolution in Science*, Pt. B, 126-133 (**eR**); Westman, “Two Cultures or One?” Pt. B, 104-112 (**eR**).

### **Topic III: The Chemical Revolution**

- Mar. 31: Eighteenth-century Chemistry: James Conant, "The Overthrow of the Phlogiston Theory," 67-74 (**eR**); Carleton Perrin, "Research Traditions, Lavoisier, and the Chemical Revolution," 55-60 (**eR**).
- Apr. 2: Lavoisier's Early Work: Perrin, "Research Traditions," 60-74 (**eR**); you may want to get a start on the reading for next time. *Written assignment to be handed in:* Submit a paragraph-long identification of the topic of your research paper. List, in proper bibliographical form, a few of the secondary and (as relevant) primary sources you've identified. (*Papers will be returned with comments next class. Some submissions will need to be revised in order to receive a grade.*)
- Apr. 7: The Discovery of Oxygen: Conant, "Overthrow," 74-105 (**eR**).
- Apr. 9: The Composition of Air and Water: Conant, "Overthrow," 105-113 (**eR**).
- Apr. 14: Post-1785 Success of the New Chemistry: Perrin, "The Triumph of the Antiphlogistians," 40-63 (**eR**).
- Apr. 16: 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. *Written assignment to be handed in:* Submit a reasonably detailed *outline* (not prose description) of your research paper with lists of the sources you've used. In a few sentences, state what your principal findings are.
- Apr. 21: Was There a Chemical Revolution?: Perrin, "Research Traditions," 53-55 (**eR**); Marco Beretta, *The Enlightenment of Matter*, 246-258 (**eR**; for those who may wish to decipher the footnotes by consulting the bibliography, the book is on reserve).
- Apr. 23: The Nature of the Chemical Revolution: Perrin, "Research Traditions," 74-81 (**eR**).
- Apr. 28: RESEARCH PAPER DUE; discussion of "History Department Survey."
- Apr. 30: A Final Evaluation: Frederic Holmes, "The Boundaries of Lavoisier's Chemical Revolution," 9-21, 38-40, 46-48 (**eR**; skim the details on 21-38, 40-46).
- May 5: Final Reflections; course evaluation administered; RESEARCH PAPER RETURNED.
- [May 7: Reading Day.]
- May 9 (Friday): REVISED RESEARCH PAPER DUE IN MY OFFICE BY 4:00 p.m. (An extension until 9:00 a.m., May 12, is possible if requested in advance *provided that most of the papers come in on schedule.*)