History 360-01. Structure of Scientific Change (CRN: 10148)

(Tu & Th 9:30-10:45, MHRA 1210)

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Office hours: Tu & Th 11:00-11:45 and 2:15-3:00 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. 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! The annotation "[*handout*]" means that I'll be distributing one or more handouts in class. The annotation "[*notes on Blackboard*]" means that I've put schematic class notes on Blackboard (under "Class Notes," entered by the date of the class). *You should print these out ahead of time and bring them to class!* 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).

Also on Blackboard (under "Course Documents") are a set of "Guidelines for Students' Essays and Papers," a take-home quiz relating thereto, and a listing of "Possible Research Paper Topics." You should print out the "Guidelines" and bring them to class on February 23. You should also print out the associated take-home quiz, which you will hand in at class time on February 25.

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 (25% of the grade), a *revised* research paper of eight-to-ten pages (50%), four shorter exercises preliminary to the paper (5% each), a take-home quiz on the essay "Guidelines" (5%), 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 be taken into account in determining your final grade (upwards of a full letter grade from the raw average of your grades, though usually much less). 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!** All assignments prepared out of class must be typed. I will not read handwritten copy.

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 of the graded assignments are subject to a penalty of up to a full letter grade for that assignment. Late submissions of out-of-class writing exercises will not be accepted. **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 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.

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

January 19: Introduction [*handout*].

January 21 & 26: Historical Background (continued): no reading, but it will be *very* helpful to begin with a quick read through Kuhn.

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

January 28 & February 2: Kuhn, *The Structure of Scientific Revolutions*, 1-51, 52-135.

February 4 & 9: Kuhn, *SSR*, 136-173, 174-210.

February 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).

February 16: 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**), or my encyclopedia article, "Kuhn, Thomas" (**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.

February 18: EXAM

February 23: Presentation of some other possible "revolutions" appropriate for research papers

(see the file "Possible Research Paper Topics"on Blackboard and look ahead at the assignment due March 16). Discussion of essay "Guidelines" and associated take-home quiz (both also on Blackboard; the quiz is to be handed in at the start of the next class). [*handout*]

Topic II: The Copernican Revolution

February 25: Background: Kuhn, *The Copernican Revolution*, 1-8, 25-41, 64-77, 100-106, 113-133, and skim the rest of Chaps. 1-3. [*handout*] [*notes on Blackboard*]

March 2: Copernicus' Innovation: Kuhn, *CR*, 134-144, 160-184.

March 4: Implications of Moving the Earth: Kuhn, *CR*, 144-160, 185-209.

March 9 & 11: Spring Break; March 16: last day to drop a course without academic penalty

March 16: 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. No more than *one* each may deal with the Copernican or chemical revolution. For each topic, identify one factor that appears favorable to a Kuhnian interpretation and one that looks problematic for it.

March 18: Was There a Copernican Revolution?: I. Bernard Cohen, *Revolution in Science*, Pt. A, 105-125; Pt. B, 126-133, 135-145; Pt. D, 161-175 (**eR**; for those who may wish to consult the bibliography, the book is on reserve); Kuhn, *CR*, 200-219. [*handout*]

March 23: Buffer day.

[Additional readings for those who wish to pursue this topic further: Robert S. Westman, "Two Cultures or One? A Second Look at Kuhn's *The Copernican Revolution*" (**eR**, Pts. A & B); Howard Margolis, *Patterns, Thinking, and Cognition: A Theory of Judgment* (book on reserve); Howard Margolis, *Paradigms and Barriers: How Habits of Mind Govern Scientific Beliefs* (book on reserve).]

Topic III: The Chemical Revolution

March 25: 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**). [*notes on Blackboard*]

March 30: 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.) [*notes on Blackboard*]

April 1: The Discovery of Oxygen and the Composition of Water: Conant, "Overthrow," 74-113 (**eR**). [*notes on Blackboard*]

April 6: Post-1785 Success of the New Chemistry: Perrin, "The Triumph of the Antiphlogistians," 40-63 (**eR**). [*notes on Blackboard*]

April 8: 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. [*notes on Blackboard*]

April 13: 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). [*handout*] [*notes on Blackboard*]

April 15: The Nature of the Chemical Revolution: Perrin, "Research Traditions," 74-81 (**eR**). [*notes on Blackboard*]

April 20: RESEARCH PAPER DUE. (An extension until next class is possible *if requested in advance* **and** *provided that most of the papers come in on schedule*.)

April 22: A Voice *con*: Frederic Holmes, "The Boundaries of Lavoisier's Chemical Revolution," 9-21, 38-40, 46-48 (**eR**; skim the details on 21-38, 40-46).

April 27: A Voice *pro*: Howard Margolis, *Paradigms and Barriers*, 43-67 (**eR**; see also 28-32 for what he means by "barrier").

[An additional reading is on eReserves for those who wish to pursue this topic further: Andrew Pyle, "The Rationality of the Chemical Revolution."]

April 29: Final Reflections; RESEARCH PAPER RETURNED.

[May 4: last day of classes; follows *Friday* schedule]

May 7 (Friday): REVISED RESEARCH PAPER DUE IN MY OFFICE BY 4:00 p.m. (An extension until 9:00 a.m., May 10, is possible *if requested in advance* **and** *provided that most of the papers come in on schedule*.)