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Spring 2013

## Syllabus: Kuhn's Philosophy of Science

Joseph Torchia

*Providence College*

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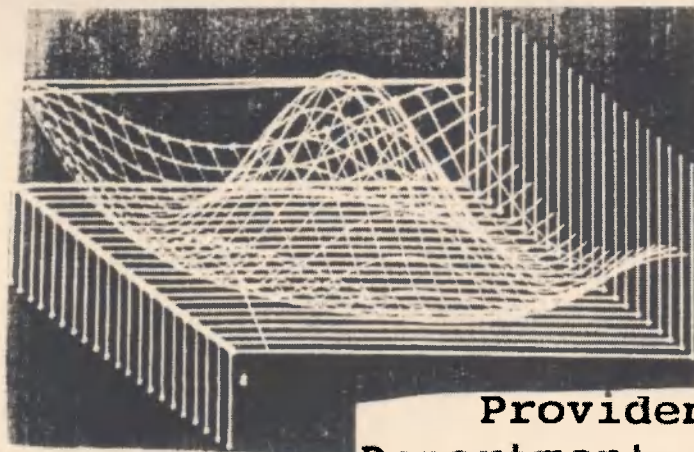
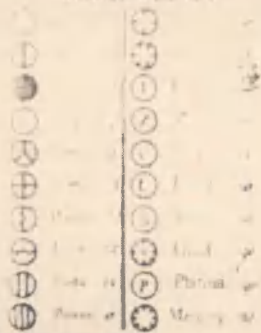
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ELEMENTS

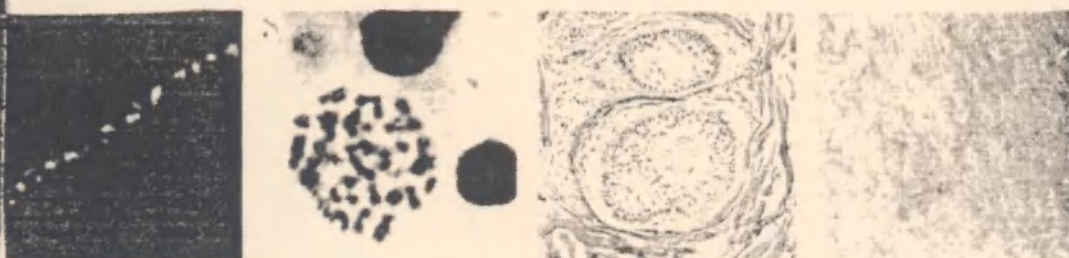


Providence College  
Department of Philosophy



# Kuhn

Father Joseph Torchia, O.P.  
Honors Colloquium  
Spring, 2013



"Let us then assume that crises are a necessary precondition for the emergence of novel theories and ask next how scientists respond to their existence. Part of the answer, as obvious as it is important, can be discovered by noting first what scientists never do when confronted by even severe and prolonged anomalies. Though they may begin to lose faith and then to consider alternatives, they do not renounce the paradigm that has led them into crisis. Once it has achieved the status of a paradigm, a scientific theory is declared invalid only if an alternate candidate is available to take its place."

Thomas Kuhn, *The Structure of Scientific Revolutions*

## Introductory Remarks

Welcome to your Honors Colloquium "Kuhn's Philosophy of Science". The following pages provide important information regarding its organization and objectives, basic requirements, attendance policy, a thematic outline, and a tentative schedule of readings.

Keep this syllabus near at hand throughout the semester as a multi-dimensional guide. Read the entire syllabus carefully after our initial meeting, so as to familiarize yourself with the goals, content, and general thrust of the colloquium.

Best wishes for an enriching and productive semester.

Father Joseph Torchia, O.P.  
Department of Philosophy.

1. to achieve a better grasp of some of the key issues and problems in contemporary philosophy of science;
2. to acquire a deeper appreciation of the role of non-rational factors upon the development of scientific problems, theories, and research methods;
3. to attain an increased competence in the preparation and writing of a critical philosophical discussion of a topic pertinent to contemporary philosophy of science.

Joseph Torchia, O.P.  
 Department of Philosophy  
 Sienna 119  
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### **"Kuhn's Philosophy of Science"**

**Meetings: M 2:30-5:00 P.M.**

#### **Description**

A critical investigation of the philosophy of science of Thomas Kuhn (1922-1996), with a special focus upon his critique of the classical model of the development of science in terms of a cumulative acquisition of knowledge, and by implication, a gradual progression toward truth. In broader terms, the course assesses the metaphysical and epistemological implications of Kuhn's understanding of scientific change and the possibility of scientific progress.

#### **General Objectives**

The colloquium is guided by the following goals:

1. to investigate the development of Kuhn's philosophy of science through several key periods, and works that reflect the maturation of his positions;
2. to evaluate the strengths and weaknesses of Kuhn's revolutionary model of scientific growth against the background of the history of science;
3. to assess the broader metaphysical and epistemological implications of Kuhn's philosophy of science and the relevance of his thesis for non-scientific areas of human inquiry.

#### **Learning Objectives**

The colloquium will attempt to lead the student to the following set of accomplishments:

1. to achieve a better grasp of some of the key issues and problems in contemporary philosophy of science;
2. to acquire a deeper appreciation of the role of non-rational factors upon the development of scientific problems, theories, and research methods;
3. to attain an increased competence in the preparation and writing of a critical philosophical discussion of a topic pertinent to contemporary philosophy of science.

## General Requirements

### 1. Attendance Policy

Regular attendance is imperative. Students are likewise expected to arrive at class on time. Please note that excessive absences and chronic lateness are relevant factors in the computation of the final grade. What constitutes "excessive absences"? Such a phrase must be interpreted in terms of a standard of judgment. In this case, the standard is the expectation of perfect attendance throughout the semester, with the exception of clearly "excusable absences". But absence from class (for whatever reason) is always a serious matter; absentees miss important information and classroom experiences that simply cannot be acquired on a second-hand basis. Please note that your registration in this course constitutes an implicit agreement on your part that (a) perfect attendance is mandatory (except for excusable and verifiable reasons) and (b) that the professor reserves the right to adjust the final grade in a manner that is fair and proportionate to the student's consistency of participation and overall quality of performance. Accordingly, those with more than one unexcused absence over the course of the semester will be subjected to a full letter grade reduction. Those with more than two unexcused absences over the course of the semester will receive a grade of "F". For the stipulations governing excusable absences (and the method of documentation and verification), please consult the appropriate section regarding academic policies in respect to class attendance records in the College Bulletin.

### 2. Policy for Missed Assignment Deadlines

Assignments must be submitted on the designated date. Failure to do so will result in a grade penalization determined by the professor, in the absence of a clearly excusable reason for a late submission.

### 3. Grading Criteria

The final grade will be based upon the following criteria:

- Mid-Term Writing Assignment (20%)
- Final Writing Assignment (20%)
- Major Writing Project (35%)
- Quality of Participation (25%): based upon formal presentations and active contribution to discussions

### 4. Grading Scale

**A: 100-95/A-: 94-91/ B+: 90-87/B: 86-83/B-: 82-80/C+: 79-76/  
C: 75-72/C-: 71-70/D+: 69-66/D: 65-63/D-: 62-60/F: 59-**

## Major Writing Project Guidelines

The following statement provides a general description of your writing project, along with a methodology and general specifications. As stated above, this assignment encompasses 33% of the final grade.

### Task

The assignment will challenge the student to come to terms with Kuhn's philosophy of science and its application in a critical manner. In broader terms, it offers an opportunity to consider scientific practitioners as participants in, of, the larger culture in which they work.

### 5. Required Materials

#### Methodology

Laudan, Larry. *Progress and Its Problems. Towards a Theory of Scientific Growth*. Berkeley: University of California Press, 1977.

Thomas S. Kuhn. *The Copernican Revolution. Planetary Astronomy in the Development of Western Thought*. Cambridge, Mass.: Harvard University Press, 1985.

\_\_\_\_\_. *The Essential Tension. Selected Studies in Scientific Tradition and Change*. Chicago and London: The University of Chicago Press, 1977.

\_\_\_\_\_. *The Structure of Scientific Revolutions*. Second Edition. Chicago: The University of Chicago Press, 1970.

\_\_\_\_\_. *The Road Since Structure. Philosophical Essays, 1970-1993, with an Autobiographical Interview*. Edited by James Conant and John Haugeland. Chicago and London: The University of Chicago Press, 2000.

#### Specifications

In addition, supplementary readings will be assigned as needed over the course of the semester.

The paper should be typed, double-spaced, with no larger than a twelve-point font. No cover page is necessary. Your grade will reflect your level of analysis and the overall quality of your treatment of the topic. Factors such as neatness, correct spelling, and proper grammatical usage will also contribute to your grade. The paper should conform to the norms of a standard style manual (e.g., *Turabian* or *MLA*). Please bear in mind that plagiarism (using the words and ideas of another without crediting the source) is a serious offense. Its detection will result in an outright failure. The paper should also include (at the very conclusion) this plagiarism disclaimer statement: "To the best of my knowledge, the ideas and content of this paper are my own, unless otherwise indicated in a note." This statement should be followed by your signature.

## **Major Writing Project Guidelines**

The following statement provides a general description of your writing project, along with a methodology and general specifications. As stated above, this assignment encompasses 35% of the final grade.

### **Task**

The assignment will challenge the student to come to terms with Kuhn's philosophy of science and its application in a critical manner. In broader terms, it offers an opportunity to consider scientific practitioners as participants in, and shapers of, the larger culture in which they work.

### **Methodology**

Early in the semester, each member of the class will select a discovery or innovation from the history of science (e.g., Newtonian mechanics; Darwin on evolution; Rutherford and Bohr on atomic structure; Einstein and relativity theory; Heisenberg's principle of uncertainty; Watson's and Crick's DNA model) as a touchstone for analyzing Kuhn's interpretation of scientific progress in revolutionary terms as a paradigm-shift which eventually displaces an earlier time-honored paradigm in favor of a more compelling one. In this respect, the first task lies in assessing the extent to which the advance under scrutiny meets Kuhn's criteria for a "paradigm-shift" and its accompanying transition from "normal science" (and a universally shared set of assumptions about the way things are), to a shattering of this world-view, and its eventual supplantation by a radically different competitor. The student will then ascertain the extent to which this touchstone has precipitated a decisive shift in (a) the problems available for analysis, and (b) the very standards by which a profession or discipline determines what counts as an acceptable problem and solution(s). Finally, the writer will explore the extent to which the development in question altered the scientific imagination in such a way as to transform the thought-world of scientists, and by extension, an entire cultural perspective embracing a variety of intellectual viewpoints.

### **Specifications**

The paper should be a minimum of 15 pages, but not more than 17 pages in length. It should be doublespaced, with no larger than a twelve-point font. No cover page is necessary. Your grade will reflect your level of analysis and the overall quality of your treatment of the topic. Factors such as neatness, correct spelling, and proper grammatical usage will also contribute to your grade. The paper should conform to the norms of a standard style manual (e.g., Turabian or MLA). Please bear in mind that plagiarism (using the words and ideas of another without crediting the source) is a serious offense. Its detection will result in an outright failure. The paper should also include (at the very conclusion) this plagiarism disclaimer statement: "To the best of my knowledge, the ideas and content of this paper are my own, unless otherwise indicated in a note." This statement should be followed by your signature.

"Drawing from various fragments of a project still in progress, I must now emphasize that revolutions are but one of two complementary aspects of scientific advance. Almost none of the research undertaken by even the greatest scientists is designed to be revolutionary, and very little of it has any such effect. On the contrary, normal research, even the best of it, is a highly convergent activity based firmly upon a settled consensus acquired from scientific education and reinforced by subsequent life in the profession. Typically, to be sure, this convergent or consensus-bound research ultimately results in revolution. Then, traditional techniques and beliefs are abandoned and replaced by new ones. But revolutionary shifts of a scientific tradition are relatively rare, and extended periods of convergent research are the necessary preliminary to them."

Thomas Kuhn, *The Essential Tension*

### "Kuhn's Philosophy of Science"

#### Description and Overview

Does science advance by a steady, cumulative progression toward truth, or does it encompass a series of revolutionary changes, whereby one dominant model is supplanted by another, on the basis of greater problem-solving effectiveness? This question is a central feature of contemporary discussions in the philosophy of science, and more specifically, in the extended intellectual program of Thomas Kuhn, one of the most influential 20th century thinkers. In a very real sense, Kuhn's work has seriously challenged the truth-value of scientific theories and redefined the very meaning of scientific discovery. Kuhn's impact has been immense, opening new avenues of investigation in fields as diverse as theology, literature, art criticism, politics, economics, and business. This course involves a critical investigation of the development of Kuhn's "paradigm" analysis, assessing its broader metaphysical and epistemological implications, and the problems it poses for communication between competing conceptual frameworks.

The course is designed to appeal to humanities and science majors alike. My goal is to present an in-depth analysis of Kuhn's intellectual career as an extended project, and to use this analysis as a means stimulating critical reflection on the nature of scientific practice against the background of the history of science itself. While many applaud the notion that we live in a "post-Kuhnian" age, Kuhn's thesis that science proceeds by means of a series of revolutionary "paradigm-shifts" has been the focus of much criticism, not only among philosophers, but among scientists as well. But such criticism notwithstanding, his seminal work *The Structure of Scientific Revolutions* (initially published in 1962) represents a veritable landmark in intellectual history.

Concerning Kuhn: A Preliminary Bibliography

Barry Barnes. *T.S. Kuhn and Social Science* (New York: Columbia University Press, 1982).

Alexander Bird. *Thomas Kuhn* (Princeton, New Jersey: Princeton University Press, 1983).

**Thomas S. Kuhn**  
(July 18, 1922–June 17, 1996)

Steve Fuller. *Thomas Kuhn: A Philosophical History of Our Times* (Chicago: University of Chicago Press, 2000).

**A Brief Biographical Sketch**

Thomas Kuhn, a native of Cincinnati, Ohio, graduated from Harvard University (1943), where he majored in Physics. He subsequently took a Master's degree and doctorate (1949) in Physics from Harvard. During his tenure as a Harvard Junior Fellow, he shifted his academic focus to the study of the history and philosophy of science. Kuhn was designated a Guggenheim Fellow in 1954.

Kuhn later taught Philosophy and History at the University of California at Berkeley, where he was named Professor of the History of Science (1961). During that period, he wrote his highly influential *The Structure of Scientific Revolutions* (published in 1962). In 1964, he became the M. Taylor Pyne Professor of Philosophy and History of Science at Princeton University. In 1982, Kuhn was awarded the George Sarton Medal in the History of Science. Between 1979 and 1991, Kuhn served as the Laurence S. Rockefeller Professor of Philosophy at the Massachusetts Institute of Technology.

During his career, Kuhn received honorary degrees from a number of institutions, including Columbia University, the University of Notre Dame, the University of Chicago, the University of Padua, and the University of Athens. At the time of his death in 1996, he was survived by his wife and three children.

Wes W. Sherrock. *Kuhn: Philosopher of Scientific Revolutions* (Malden, Mass.: Polity, 2002).

David Charles Stove. *Scientific Irrationalism: Origins of a Postmodern Cult* (New Brunswick, New Jersey: Transaction Publishers, 2001).

### Concerning Kuhn: A Preliminary Bibliography

- Barry Barnes. *T.S. Kuhn and Social Science* (New York: Columbia University Press, 1982).
- Alexander Bird. *Thomas Kuhn* (Princeton, New Jersey: Princeton University Press, 2000).
- Steve Fuller. *Thomas Kuhn: A Philosophical History of Our Times* (Chicago: University of Chicago Press, 2000).
- \_\_\_\_\_. *Kuhn vs. Popper: The Struggle for the Soul of Science* (New York: Columbia University Press, 2004).
- Gary Gutting (editor). *Paradigms and Revolutions: Appraisals and Applications of Thomas Kuhn's Philosophy of Science* (Notre Dame: University of Notre Dame Press, 1980).
- Paul Horwich (editor). *World Changes: Thomas Kuhn and the Nature of Science* (Cambridge, Mass.: MIT Press, 1993).
- Paul Hoyningen-Huene. *Reconstructing Scientific Revolutions: Thomas S. Kuhn's Philosophy of Science* (Chicago; London: University of Chicago Press, 1993).
- James A. Marcum. *Thomas Kuhn's Revolution: An Historical Philosophy of Science* (London; New York: Continuum, 2005).
- Howard Margolis. *Paradigms & Barriers: How Habits of Mind Govern Scientific Beliefs* (Chicago: University of Chicago Press, 1993).
- Caroline Jean Picart. *The Darwinian Shift: Kuhn vs. Laudan* (Acton, Mass.: Copley Custom Publishing Group, 1997).
- Wes W. Sharrock. *Kuhn: Philosopher of Scientific Revolutions* (Malden, Mass.: Polity, 2002).
- David Charles Stove. *Scientific Irrationalism: Origins of a Postmodern Cult* (New Brunswick, New Jersey: Transaction Publishers, 2001).

## Tentative Methodology/Outline

### Introduction

Initial Observations: A Non-Scientist looks at the history of science  
 Four viewpoints on the philosophy of science  
 Two attitudes toward science  
     (a) science yields truth  
     (b) scientific pronouncements yield opinion  
 Scientific rationality  
 Commensurability/Incommensurability  
     (a) criteria of theory choice  
     (b) rational/non-rational factors

### I. Kuhn on the Copernican Revolution

We begin with a look at Kuhn's seminal case-study of paradigm-shifts: in this case, an analysis of the transition from a Ptolemaic, geocentric world-view to a Copernican, heliocentric one, and how (in Kuhn's words), "the Copernican Revolution offers an ideal opportunity to discover...with what effects the concepts of many different fields are woven into a single fabric of thought."

**Text:** Kuhn, *The Copernican Revolution. Planetary Astronomy in the Development of Western Thought*. Cambridge, Mass.: Harvard University Press, 1985.

### II. Kuhn on Scientific Revolutions

In this core section of the colloquium, we examine Kuhn's major statement on scientific change, with a consideration of such key topics as normal science, the priority of paradigms, anomaly and the emergence of scientific discoveries, crisis and the formulation of scientific theories, responses to crisis, the nature and necessity of scientific revolutions, revolutions as changes of world-view, and progress through revolutions.

**Text:** Kuhn, *The Structure of Scientific Revolutions*. Second Edition. Chicago: The University of Chicago Press, 1970.

### III. Kuhn and His Critics

We next confront Kuhn's continuing assessment of his intellectual project, with a specific focus on the development and refinement of the thesis formulated in the first and second editions of *The Structure of Scientific Revolutions*. Accordingly, we will examine a collection of essays in which he wrestles with the philosophical implications of his understanding of scientific change, in both an epistemological and a metaphysical context.

**Text:** Kuhn, *The Essential Tension. Selected Studies in Scientific Tradition and Change*. Chicago and London: The University of Chicago Press, 1977.

### IV. Kuhn's Journey of Inquiry

Our examination of Kuhn's self-assessment moves to the final stage of his intellectual career, as reflected in a collection of essays assembled around the time of his death in 1996. This collection provides our segue to his serious rethinking of the fundamental presuppositions inherent in his own outlook, most notably the meaning of paradigmatic shifts, the possibility of scientific progress, and the incommensurability of competing conceptual frameworks and world-views. These reflections place him in conversation with some of the most prominent figures in twentieth century philosophy of science.

**Text:** Kuhn, *The Road Since Structure*. Philosophical Essays, 1970-1993, with an Autobiographical Interview. Edited by James Conant and John Haugeland. Chicago and London: The University of Chicago Press, 2000.

### Epilogue: Kuhn and His Legacy

Our colloquium concludes with a critical assessment of Kuhn's contribution to the philosophy of science and his legacy.

## **Tentative Weekly Schedule of Readings at a Glance**

### **[Abbreviations to Works:**

- The Copernican Revolution. Planetary Astronomy in the Development of Western Thought = CR**
- The Structure of Scientific Revolutions = SSR**
- The Essential Tension. Selected Studies in Scientific Tradition and Change = ET**
- The Road Since Structure = RSS**
- Progress and Its Problems. Towards a Theory of Scientific Growth = PP]**

### **Week I (1/21)**

#### **Introduction**

**Read: Materials to be distributed**

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### **Week II (1/28); Week III (2/4)**

#### **I. Kuhn on the Copernican Revolution**

**Read: CR**

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### **Week IV (2/11); Week V (2/19); Week VI (2/25)**

#### **II. Kuhn on Scientific Revolutions**

**Read: SSR**

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### **Spring Recess 3/4-3/8**

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### **Week VII (3/11)**

#### **III. Kuhn and His Critics**

**Read: ET, Ch. 7 ("The Historical Structure of Scientific Discovery," 165-177); Ch. 9 ("Tradition and Innovation in Scientific Research," 225-239); Ch. 11 ("Logic of Discovery or Psychology of Research," 266-292).**

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### **Week VIII (3/18); Week IX (3/25)**

#### **III. Kuhn and His Critics, continued**

**Read: ET, Ch. 12 ("Second Thoughts on Paradigms," 293-319); Ch. 13 ("Objectivity, Value Judgment, and Theory Choice," 320-339).**

Week X (4/3); Week XI (4/8)

#### IV. Kuhn's Journey of Inquiry

Read: RSS, Foreward and Editor's Introduction; Ch. 1  
 ("What are Scientific Revolutions?," 13-32);  
 Ch. 2 ("Commensurability, Comparability,  
 Communicability," 33-57).

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Week XII (4/15); Week XIII (4/22)

#### IV. Kuhn's Journey of Inquiry, continued

Read: RSS, Ch. 4 ("The Road Since Structure," 90-104);  
 Ch. 9 ("Rationality and Theory Choice," 208-  
 215).  
 PP, Ch. 3 (From Theories to Research Traditions,  
 70-120).

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Week XIV (4/29)

#### Epilogue: Kuhn and His Legacy

Read: PP, Ch. 4 (Progress and Revolution, 121-151).  
 Alasdair C. MacIntyre, "Epistemological Crises,  
 Dramatic Narrative and the Philosophy of Science"  
 (article to be distributed).

### Order of Presentations

CR, Chapters 1, 2

CR, Chapters 3, 4

CR, Chapters 5, 6

CR, Chapter 7

SSR, Chapters 1, 2

SSR, Chapters 3, 4

SSR, Chapters 5, 6

SSR, Chapters 7, 8

SSR, Chapters 9, 10

SSR, Chapters 11, 12

SSR, Chapter 13 and Postscript

ET, Chapter 7

ET, Chapter 9

ET, Chapter 11

ET, Chapter 12

ET, Chapter 13

RSS, Chapter 2

RSS, Chapter 4

RSS, Chapter 9

PP, Chapter 3

PP, Chapter 4

### Semester Calendar

January 22 (Tuesday):	Classes begin.
February 18 (Monday):	President's Day Holiday.
February 19 (Tuesday):	Monday Class Schedule.
March 2-10 (Sat.-Sun.):	Spring Recess.
March 15 (Friday):	Mid-Semester Date.
March 22 (Friday):	Date for Submission of Mid-Semester Grades.
March 28-April 1 (Thurs.- Mon.):	Easter Recess
April 3 (Wednesday):	Monday Class Schedule.
April 22 (Monday):	Date for Submission of Writing Project.
May 3 (Friday):	Last Day of Classes.
May 4-5 (Sat.-Mon.):	Reading Period.
May 7 (Tuesday):	Reading Day.
May 8-11 (Wed.-Sat.); May 3 (Monday):	Final Examination Period