

HISTORY 3301

Dr. Charles W. "Skip" Clark

**HISTORY AND PHILOSOPHY OF SCIENCE**

Fall 2008

(also cross-listed as Phil 3301; Chem. 4003)

Office: Cobb Hall Graduate School

MW 2:00-3:15 pm

X96419

Classroom: Pafford 208

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Office Hrs: MW: 1:00-2:00, TTH 2:00-3:00 and by Appt.

Note: History majors may use the course for either the thematic or European requirement.

***COURSE DESCRIPTION:***

This course is an overview of the historical development of the major areas of science and scientific ideas. In addition, the course will examine the philosophical development of scientific methods and results. Chronologically, the major focus will be on the period from the Greeks through the development of modern science. Attention will also be directed to the differences between science and pseudo-science.

We will also examine science and scientific inquiry within the broader context of society itself. Science cannot be separated from the environment in which it was created. Even the basic questions to be asked, and the approaches which can be taken are, in large measure, the result of the society in which scientific inquisitiveness developed. Nor is the history of science a story of progress toward some goal (except, perhaps in the broadest sense of making sense of the world). Some paths were dead ends, others led in strange directions, and still others led to a clearer understanding of the world. Finally, we will look at the contributions of non-western cultures, primarily the Muslim, but also Asian, to western science, because without the impact of Muslim learning on the West, and to an extent the Asian, beginning in the twelfth century, western scientific activity would have been far different than it was.

***LEARNING OUTCOMES:***

- By the end of the course, the student will be able:
- To describe the major chronological developments in the history of science;
  - To delineate the major philosophical schools of thought and their impact on the development of scientific thought;
  - To analyze in oral and/or written form the differences between science, non-science and pseudo-science; and
  - To demonstrate, in written and oral forms, a grasp of the relationship between scientific developments and ideas and the environment--social, economic, political and cultural--in which they developed.

***Procedures, Policies, etc.:***

**CLASS ATTENDANCE, ETC.**—I expect students to attend class. Lectures and discussions form a large part of the course and class attendance is the best way to get that material. Students are responsible, in any case, for material covered in class whether they are there or not. Three unexcused absences will result in a lowering of the final grade. Please turn off all cell phones, beepers, etc., BEFORE entering the classroom. I will

remove disruptive or non-attending students from the class roll. Students with documented special needs will present the proper paperwork before being granted the special needs.

**TESTS**--There will be two-hour exams and a final examination in this course. The final examination will consist of at least one essay that is cumulative, and other questions that will cover material presented since the last examination. Tests usually will consist of short answer, essay, and occasionally, fill-in-the-blank questions. "Pop quizzes" may be given if attendance or enthusiasm wanes.

**PAPERS**--Students will write **two** (2) short papers, **five to seven pages** in length, typed and double-spaced. Topics will be discussed in class. A clear focus and point, elegant organization, rational argument, well-chosen supporting evidence and examples, lucid writing style and proper acknowledgment of sources characterize good papers. Any student who is uncertain about, or inexperienced with, the use of footnotes or endnotes should consult me or one of the many manuals available. Turabian's Manual for Writers of Term Papers, Theses, and Dissertations is useful here. Occasionally, an emergency may arise which causes a paper to be unfinished on the date it is due. Therefore, if such an emergency does occur, the paper will be accepted the Monday following the due date, **by class time**. No late papers will be accepted.

**DUE DATES FOR THE PAPERS:** 1<sup>st</sup>: **September 17, 2008**; 2<sup>nd</sup>: **November 19, 2008**

**GRADING:** The breakdown of the grading is as follows:

2 hour quizzes @ 15%, 20%	35%
1 final examination	25%
2 short papers @ 15% each	30%
class participation and "pop quizzes"	<u>10%</u>
	100%

Thoughtful and active class participation may affect the final grade positively.

### **REQUIRED BOOKS:**

Crowe, Michael J. Theories of the World from Antiquity to the Copernican Revolution 2<sup>nd</sup>. Rev. ed. New York: Dover, 2001

Dear, Peter. Revolutionizing the Sciences: European Knowledge and Its Ambitions, 1500-1700. Princeton: Princeton University Press, 2001

DeWitt, Richard. Worldviews: An Introduction to the History and Philosophy of Science. Malden, Ma.: Blackwell, 2004.

Klemke, E.D., Hollinger, Robert, et al. (eds.) Introductory Readings in the Philosophy of Science. 3<sup>rd</sup> ed. Amherst, NY: Prometheus Books, 1998

**NOTE: Please bring 3 small blue books to class for use in taking your tests. You should write your name in the upper right-hand corner of the blue book. Please turn those in by the end of the second week of class.**

## **SCHEDULE:**

### **August**

#### ***Unit I: Fundamental Issues in the History and Philosophy of Science***

18: Introduction, What is the History and Philosophy of Science? Review of syllabus

20: Explanation and “Truth”; “Facts”

Reading: DeWitt: World Views, Introduction and Klemke, E.D., Hollinger, Robert, et al. (eds.) Introductory Readings in the Philosophy of Science., Introduction, ch. 1-2.

25: Evidence, Reasoning and the “Scientific Method”

Reading: DeWitt: World Views, Ch. 4-5; Klemke, E.D., Hollinger, Robert, et al. (eds.) Introductory Readings in the Philosophy of Science. Pp. 225-253

27: Problems and Uses of the Scientific Method

Reading: DeWitt: World Views, Ch. 6-8; Klemke, E.D., Hollinger, Robert, et al. (eds.) Introductory Readings in the Philosophy of Science. pp. 309-351

### **September**

#### ***Unit II: History of Science to Aristotle***

1: Labor Day **No Classes**

3: Pre-history and early Babylonian and Egyptian number systems

Reading: [http://www.math.buffalo.edu/mad/Ancient-Africa/mad\\_ancient\\_egypt\\_arith.html](http://www.math.buffalo.edu/mad/Ancient-Africa/mad_ancient_egypt_arith.html) ;  
[http://www.math.tamu.edu/~dallen/masters/egypt\\_babylon/babylon.pdf](http://www.math.tamu.edu/~dallen/masters/egypt_babylon/babylon.pdf)

8: Pre-Socratic Greek Science: “What is it?” “What makes it go?” “How do we know?”

Reading: <http://www.fordham.edu/halsall/science/sciencesbook.html#Greece>  
articles on Thales, Anaximander, Anaximenes, and Anaxagoras;

10: CLASSICAL GREEK SCIENCE: Plato’s view of being and knowing

Reading: <http://www.fordham.edu/halsall/science/sciencesbook.html#Greece>  
articles on Parmenides, Empedocles, Democritus, Heraklitos;  
<http://www.wsu.edu/~dee/GREECE/ALLEGORY.HTM#A> on Plato’s Cave analogy  
from the Republic.

15: ARISTOTLE

Reading: DeWitt, Worldviews, Ch. 9

### ***Unit III: Creation of the Aristotelian Edifice***

17: GREEK MATHEMATICS AND ASTRONOMY BEFORE PTOLEMY

Reading: Crowe, Theories of the World, ch. 1-3.

### **First paper due**

22: PTOLEMY

Reading: DeWitt, Worldviews, Ch. 10-13; Crowe, Theories of the World, ch. 4.

24: CLASSICAL GREEK SCIENCE: Greek Medicine

Reading: <http://classics.mit.edu/Browse/browse-Hippocrates.html> Hippocratic works--“Airs, Waters and Places,” “Aphorisms,” “The Oath”

### **29: First Hour Exam**

## **October**

### ***Unit IV: New challenges and transformations in the classical world***

1: Pluralism and Hellenistic Natural Philosophy

Reading: <http://www.history.rochester.edu/steam/hero/> sections 1, 10, 14, 45, 50, 56, 57

6: The Romans and Science

Reading: <http://www.hsl.virginia.edu/historical/artifacts/antiqua/alexandrian.cfm>

### ***UNIT V: Science and Christianity in the Middle Ages***

8: EARLY MIDDLE AGES (5th-12th century): the legacy of the classical world; new developments; the spread of Latin learning

Reading: TBA

13: SCIENCE IN ISLAM

Reading: <http://www.fordham.edu/halsall/med/nasr.html>

15: THE TWELFTH AND THIRTEENTH CENTURIES: The impact of Arabic science; the “re-creation” of the Aristotelian edifice and attacks on Aristotle

Reading: <http://www.fordham.edu/halsall/source/adelardbath1.html> on Adelard of Bath

20: SCIENCE AND PSEUDO-SCIENCE: Science, magic, astrology, and alchemy  
Reading: Klemke, E.D., Hollinger, Robert, et al. (eds.) Introductory Readings in the Philosophy of Science., pp. 66-75;

22: MEDICINE AND NATURAL SCIENCE IN THE MIDDLE AGES  
Reading: TBA

### ***Unit VI: The Attack on Aristotle: The Scientific Revolution***

27: THE SCIENTIFIC REVOLUTION: Copernicus and the Great Debate  
Reading: Dear, Revolutionizing the Sciences, Introduction and ch. 1-2;  
DeWitt, Worldviews, Ch. 14; Crowe, Michael J. Theories of the World from Antiquity to the Copernican Revolution, ch. 5-6.

29: THE SCIENTIFIC REVOLUTION (con'd): How was knowledge known and what was it for?  
Reading: Dear, Revolutionizing the Sciences, ch. 3-4, 6; DeWitt, Worldviews, Ch. 15-17; Crowe, Michael J. Theories of the World from Antiquity to the Copernican Revolution, ch. 7-9

### **November**

3: THE SCIENTIFIC REVOLUTION Creation of the Mechanical Universe; domination of Nature; Newtonian Mechanics  
Reading: Dear, Revolutionizing the Sciences, ch. 5, 7-8; DeWitt, Worldviews, Ch. 18-19

5: NEWTONIAN MECHANICS (con'd)  
Reading: Dear, Revolutionizing the Sciences, same and Conclusion; DeWitt, Worldviews, Ch. 20

### **10: Second Hour Examination**

### ***Unit VII: Toward "Modern Science"***

12: The Industrial Revolution: The Development of Chemistry  
Reading: DeWitt, Worldviews, Ch. 21

17: Physical Sciences in the 19<sup>th</sup> Century: Fields, Waves, Thermodynamics  
Reading: Same

19: Natural History in the 19<sup>th</sup> Century: Geology and Biology B the Darwinian Revolution  
Reading: Klemke, E.D., Hollinger, Robert, et al. (eds.) Introductory Readings in the Philosophy of Science, pp. 105-134

**SECOND PAPER DUE BY 4:00 P.M.**

## ***Unit IX: Twentieth-Century and Beyond***

24: Physics in the Twentieth Century and the Structure of Space/Time  
Reading: DeWitt, Worldviews, Ch. 22, 23

### **December**

1: Quantum Theory and Beyond

Reading: DeWitt, Worldviews, Ch. 24-25

3: Quantum Theory and Beyond (Con'd)

Reading: DeWitt, Worldviews, Ch. 26-29

**MONDAY DECEMBER 8, 2008 2:00-4:00 P.M. FINAL  
EXAMINATION**