The Irrationality of Western Science
Honors Seminar
Syllabus

Professor Robert Hahn
Office Hours: Tuesday and Thursday 7:30-9:45am
and by appointment
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1) Course Introduction

Part I: The Traditional Idea of the Rationality of Science and its Challenges:

   a) Introduction to Geometry as a system.
      i) Definitions
      ii) Postulates
      iii) Common-Notions
   b) The Idea of Proof or Demonstration
      i) Theorems. Bk. I

   a) Euclid’s theorems, Bk.I
   b) Aristotle’s Theory: Deduction vs Demonstration
      (i) Syllogistic/Logic & Deduction, Prior and Posterior Analytics
      (ii) Aristotle’s Theory of Demonstration, Posterior Analytics
   d) Aristotle’s Proof of the Irrational

4) Aristotle and the Problem of First Principles: The Irrational Foundation of Rational Demonstration?
   Since every proof rests on assumptions/principles, HOW do we grasp (and moreover, “justify”) these primary assumptions/principles?
   a) Aristotle, Posterior Analytics II, 19.

5) Euclid, Aristotle, and Eratosthenes: The Application of the Deductive
Method (Reading: from Hahn’s *Formal Deductive Logic*, ch. 4)

a) Arguments for the Sphericity of the Earth
b) Physical Presuppositions: Problems in early Astronomy
c) Applying Euclid’s *Parallel theorems*
d) The Measurement of the Circumference of the Earth

6) Field Trip to the Planetarium at The University of Missouri at St. Louis
   a) Picturing the Cosmos and Ancient Sundials
   b) Plotting the Sun’s path: the Solstice and Equinox
   c) The Zodiac and the calculation of the Solar Year

7) Deductive Reasoning and the Challenge to “Common-Sense”: The Triumph of the Mind over the Body and the Senses (Reading: from Kirk-Raven, *The PreSocratic Philosophers*, and Plato’s *Meno* and *Parmenides*).
   a) Zeno’s Paradoxes: the Dichotomy and the Arrow
   b) The Pythagorean Theorem and the Discovery of the Irrational
   c) Gorgias’ argument: *Nothing Exists*
   d) Plato’s Argument in the *Theaetetus* that “false opinion is impossible.”
   e) Meno’s Argument: All Learning is Impossible
   f) Plato’s *Parmenides* argument: The Unreality of Plurality
   g) Aristotle’s Argument concerning the Unreality of Time

8) The Triumph of the Mind over the Body and Senses: Part I
   Grasping Reality Behind the Appearance (Reading: from Plato’s *Plato’s theory of Ideas/Forms* (Ultimate Reality), *Republic*, Bk. VII, Hahn’s article in the *Journal of the History of Philosophy*, and an article by Harold Cherniss, “The Philosophical Economy of the Theory of Ideas”).

9) Triumph of the Mind over the Body and Senses: Part II
   Grasping Reality Behind the Appearance (Reading: from Aristotle’s *Metaphysics A and L*, and summary of Aristotle’s physical theories from the *De Caelo*)
   a) Aristotle doctrine of Being (Ultimate Reality) and the Unmoved Mover.
10) Re-Thinking the Conventional Interpretation of Western Rationality and Science:
   Part I (Reading from Kuhn, *Structure of Scientific Revolutions*)
   a) Normal vs Paradigmatic Science
   b) “Revolutions” in Science
      i) the social and political context
      ii) the importance of the community
      iii) the importance of case studies
   c) Quine’s Indeterminacy of Translation Argument
   d) Feyerabend’s *Against Method*.

11) Mid-Term Examination.

   **Part II: The Irrationality of Western Science: Case Studies from the History of Science**

12  Case Studies #1: Copernicus and the Geocentric Hypothesis. Galileo, Aristotle and Aristotelianism.

13. Case Studies #2: The Heliocentric Hypothesis, Kepler and the Planetary Laws of Motion;

14: Case Study #3: The Heliocentric Hypothesis, Newton, Universal Gravitation & Alchemy.
    Why are the planets in the orbits they are in?

15) Final Exam.
Evaluations/Grades: (Please Read Carefully)

Your grade will be determined by several contributing factors:

1) regular attendance and participation in weekly seminar meetings
2) a weekly 2-page (typed!) essay on an assigned topic, submitted just prior to the start of the seminar meeting** (60% of final grade)
3) a mid-term examination (20% of final grade)
4) a final examination written during our last seminar meeting (20% of final grade)

The regulations for the two-page weekly paper are very specific.

*I will not read papers longer than 2 pages in length. The paper MUST BE:
   a) typed, double-spaced;
   b) type font cannot be smaller than 12 pitch,
   c) conforming to Margins: 1 - 1/2" on the left, and 1" on top, bottom, and right.

This regular writing exercise is designed to limit your space and requires the development of written communication skills in the writing, and re-writing, of the essay.

The average grade for your weekly writing assignments will be determined by dropping your lowest grade and averaging the remaining grades.....IF you submit ALL the essay assignments. IF you do NOT submit all the essay assignments, then all the assignments will be averaged to constitute that portion of your final grade. Please Note Carefully: Any unexcused paper not submitted on time will not be graded.

**A few of the papers, submitted at the start of the seminar, will be presented orally at the start of the class. The purpose of this oral exercise will help us review the preceding class and will offer some training on presentation skills.
(a) Detailed Course Description:
After setting out the underlying background for showing how we have come to understand “science” as a “rational” enterprise connected with a logic of reasoning, we turn to examine a series of case studies that call this familiar model of science into question. The history of science shows that “science” is not simply objective, it has not developed progressively and incrementally but rather discontinuously in revolutionary new beginnings, and there is not a single account of “scientific rationality” to account for the changing arguments that have been debated at science’s center stage.

After setting out the historical materials from ancient Greece that came to be regarded as establishing a privileged point of view for understanding reality as scientific rationality, we explore the historical arguments for the geocentric model of astronomy and its historical challenges by proponents of heliocentrism.

(b) Student Learning Objectives:

1) To grasp clearly a range of meanings associated with “rationality” and the deductive model of reasoning with which it is closely associated; this is the cornerstone of what we shall call “scientific rationality.”
2) To produce an understanding of how, historically speaking, the rationality model came to predominate a popular understanding of the nature of “science” and “scientific discovery.”
3) To trace out how a certain broad interpretation of ancient Greek thought became the basis of this popular view of scientific rationality through a study of Euclid’s geometrical method, Aristotle’s logical treatises, and their applications in an ideal experiment whereby Eratosthenes measured the circumference of the earth in the 2nd century BCE.
4) To explore how this ideology of scientific rationality appeared in the competition between the sophists and the early philosophers, and how it became canonized in the writings of Plato and Aristotle.
5) To investigate the arguments that came to be regarded as compelling that the earth was the center of the universe and the heavenly bodies revolve around us – the geocentric model of astronomy.
6) To delineate the arguments that sequentially undermined the geocentric model, in the contributions by Copernicus, Galileo, Kepler, and Newton, and led to a new astronomical vision of things – the heliocentric model.
7) To become familiar with the criticisms of the popular understanding of scientific rationality by Kuhn, Popper, Feyerabend, and others.
8) To realize that these criticisms of what science is and how it works have far-reaching consequences about our self-understanding.

(c) The schedule/outline of topics and learning experiences are set out in the syllabus.

(d) Texts and Other Reading Materials:
There is one required text that consists in a series of selected readings and is available for cost at The Printing Plant in Carbondale.

(e) The details about grades are identified in the syllabus.

(f) The seminar “The Irrationality of Western Science” provides a unique educational experience, appropriate for Honors students in 3 ways:
(i) It allows the students to reflect critically on their science education.
(ii) It supplies an historical overview of standard science education in physics and astronomy relative to answering the question: Where are we in the cosmos?
(iii) It provides a field trip to a planetarium and to a local science center.
(iv) It explores criticism of standard views of science.
(v) It requires 9 written assignments, a mid-term and final examinations. Writing is the key to mastering the theories and science involved in the discussions.