

History 2402: Science and Society: From Galileo to Climate Change

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Class: Mondays, Wednesdays 11:40-12:55

Office Hours: Wednesday: 2:00-4:00

Course Description

Explores the intersection of scientific ideas and society in three historical contexts: the trial of Galileo by the Roman Inquisition during the early 17th century Europe, which examined the validity and implications of Galileo's ideas on motion physics and astronomy; 2) the 2009 United Nations Climate Change Conference in Copenhagen, which sought an international accord to limit carbon emissions; and 3) the problem of obesity, diet, and cholesterol as debated by the CDC, USDA, and the U.S. Congress during the 1990s. Because this course will be offered in an online format, it uses active-learning pedagogies to promote student interaction and engagement.

The major theme: ascendant scientific ideas do not dictate or determine societal responses; conversely, traditional ideologies and social structures do not always produce self-sustaining scientific ideas. Instead, new scientific paradigms interact with traditional beliefs, institutions and social structures in complex, indeterminate, and contingent ways.

"The Trial of Galileo," which occupies the first half of the course, illuminates the collision of the "new science," brilliantly propounded by Galileo Galilei, with the elegant cosmology of Aristotle, Aquinas, and medieval Scholasticism. It examines in greater detail the historical context of early 17th-century Rome--especially the Holy Office, the arm of the papacy that supervised the Roman Inquisition. It also considers the emerging community of scientists under the patronage of Prince Cesi, founder of the Society of the Lynx-Eyed, which promoted the new science, and also the complex role of Jesuit philosophers and mathematicians. Other factors include the ambitions of cardinals within the Vatican--and the Collegio Romana, the powerful Medici family in Florence, the imperial ambitions of the Spanish monarch, and the Protestant challenge. The issues range from the nature of faith and the meaning of the Bible to the scientific principles and methods as advanced by Copernicus, Kepler, Tycho Brahe, Giordano Bruno, and Galileo.

The "Trial of Galileo" will consist of three phases. During the first (or setup phase), the instructor will introduce the central ideas, texts, and historical contexts. During the setup phase, too, every student will be assigned a role, often as a member of a historical faction. The setup will also include several lab sessions, one on optics and the other on stellar parallax. The second phase will consist of the trial, where students will advance ideas, in their written work and in class, reflecting their positions as outlined in their role packets. The final post-mortem sessions will analyze what happened in history and further explore the ramifications of this intersection of scientific ideas and society in early 17th century Europe.

The second part of the course will focus on the growing problem of obesity in the United States in the 1990s. While the USDA had traditionally worked closely with American farmers and food producers to combat malnutrition, scientists within the CDC and the USDA encouraged a profound shift in policy to fight obesity and heart disease. The shape of the nation's policy on food was determined by congressional debates over a new USDA "food pyramid" to shape dietary policies. Complicating the debates was the fact that the science of nutrition, and especially the role of cholesterol, was in its infancy and the research was incomplete, contradictory, and in some cases, wrong; and economic pressures (and lobbyists) also played a major role in shaping policy.

The third part of the course recreates the 2009 United Nations Climate Change Conference in Copenhagen, which sought an international accord to limit carbon emissions. After studying the basic elements of environmental economics and science, and then the historical antecedents to the 2009 UN meeting, students will wrestle with national imperatives and climate change recommendations in the 2009 UN session in Copenhagen. Students will learn why climate change policy is so important—and so difficult to achieve.

All three components of the course will utilize the Reacting to the Past pedagogy, in which students play complex games, set in the past, their roles informed by important texts.

Requirements

Four short papers, each of 5 pages: 40% of grade

Class participation: Informed participation in class and with peers: 25% grade

Completion of three laboratory projects (though these are no done in labs): 15%

Final Project plus "reflection paper" 20% of grade

"Required" Readings Available at Book Culture

The following books will form the foundation for all three components of this course. All will be placed in multiple copies on reserve, and all re available in paperback. Be sure to get THESE ISBNs, and not earlier editions.

Michael Pettersen, et al *The Trial of Galileo* (Norton) ISBN 9780393937343

David E. Henderson and Susan K. Henderson, *Environmental Science and International Politics* (ISBN 9781469640297: University of North Carolina Press)

Susan Henderson and David Henderson, *Food Fight: Challenging the USDA Food Pyramid, 1991* (Open Educational Resource, 2020)

Recommended Readings

Marion Nestle, *Food Politics: How the Food Industry Influences Nutrition and Health* (ISBN 9780520275966) University of California Press

James Lovelock, *Gaia: A New Look at Life on Earth* (ISBN 9780192862181 (Oxford University Press)

Weekly Schedule of Classes

Introduction: Science and Society:

1. January 11 (M): Introduction to the Course

2. January 13 (W): Introduction to the History of Science and Active-Learning pedagogy

Thomas Kuhn, *The Structure of Scientific Revolutions*, Chapter 1: "A Role for History",

Mark Carnes, "Teaching the History of Science Through In-Class Games," *The History of Science Newsletter* (January, 2020) Vol. 49, #1.

<https://hssonline.org/resources/publications/newsletter/january-2020/innovations-in-education/>

Part I: The Trial of Galileo

MONDAY, JANUARY 18: Martin Luther King, Jr. Holiday: No Class

3. January 20 (W) Setup 1: Intellectual Foundations (1): Aristotle (1)

Read: Pettersen, *Trial of Galileo*, including readings by Aristotle, pp. 3-83. Study "Study Questions" pp. 82-83

4. January 25 (M) Setup 2: Intellectual Foundations (2): The Council of Trent and the Catholic Church

Read: Pettersen, Appendix C: "Decrees by the Council of Trent" and Galileo's *Starry Messenger*, pp. 84-108

Recommended: *Thomas Aquinas*, (Thomas McDermott, ed.) Aquinas: Selected Philosophical Writings: *Part I: Structures of Thought, Passage 1: "Natural Science, Mathematics, and Metaphysics," pp. 1-51*

The Council of Trent, "Decree 786: On the Interpretation of Scripture";

Various sections of the Bible.

5. January 27 (W) Team Project 1: On Optics and Telescopes

Required Readings: "How to Write a Lab Report," Appendix G, pp. 200-206

Also: Pettersen, Appendix E: Galileo, *Starry Messenger*, pp.84-108; and Galileo, "Letter to the Grand Duchess Christina", pp. 109-126

6. February 1 (M) **Faction Quiz** (all reading assignments):

This quiz will be taken as a group, among the four assigned groups: Linceans, Conservatives, and Moderates.

7. February 3 (W) **Session 1:** Lectures at the College of Rome

Recommended readings: "*The Early Inquisition Proceedings, (Chapter 5) in Finocchiaro, Galileo Affair: A Documentary Reader*, pp. 134-153.

8. February 8 (M) **Session 2: Holy Office**

Recommended readings: (Chapter 7) in Finocchiaro, *Galileo Affair*, pp. 198-226

9. February 10 (W) **Session 3** Focus on Linceans: Prince Cesi's Palace

Recommended Readings: David Freedberg, *The Eye of the Lynx: Galileo, His Friends, and the Beginnings of Modern Natural History (2002)*, pp. 1-141;

10. February 15 (M) **Session 4**

Holy Office: Motion Physics and Infinite Universe: Vote to End Phase I

11. February 17 (W) After 1616: **Enter: New Pope [End of Phase 1]**

TIME PASSES: Communique from Instructor concerning changes from 1616-1632. Role modifications distributed.

Recommended Readings: "*Diplomatic Correspondence, in Finocchiaro, Galileo Affair* pp. 227-255

Pietro Redondi (trans. Raymond Rosenthal), *Galileo Heretic (1987)*, pp. 3-271

12. February 22 (M) Team Project **2: On Stellar Parallax**

Read: Appendix G: pp. 211-218 Lab 2: Parallax. Lab Leaders will guide teams through Laboratory.

13. February 24 (W) **Beginning of PHASE II: Session 6: 1632**

Holy Office (1632)

Readings: Appendix F: Galileo, *Dialogue on the Two Chief World Systems* (1632), pp. 127-200

SPRING BREAK: March 1-5 (No Classes)

14. March 8 (M) **Session 7: 1632: Impact of *Dialogue on the Two Chief World Systems: Final Vote***

Holy Office: (debates continue)

15. March 10 (W) **Summary Discussion of Contingency**

Kuhn, *Structure of Scientific Revolutions*, Chapter 13: "Progress Through Revolutions"

Part II: The United States Confronts Obesity and Heart Disease: 1991

16. March 15 (M) Introduction: The Federal government and Food: from Congress to the Agencies within Health and Human Services (FDA and CDC)

Readings: Nestle, *Food Politics: How the Food Industry Influences Nutrition and Health* (Part I)

17. March 17 (W): **Session 1: Health and Human Services Debate: 1991 :**

Readings: Susan Henderson and David Henderson, *Food Fight*, pages 1-33.

18. March 22 (M) **Session 2: Congress Decides: The New Food Pyramid**

Readings: Hendersons, *Food Fight*, pages 35-59/19.

19. March 24 (W) Discussion and Summary: How does government set policy when scientific knowledge is incomplete (or wrong)?

Part III: The United Nations Debates Climate Change: Copenhagen, 1991

20. March 29 (M): Introduction: The New Science of Climate Change

Henderson, *Climate Change in Copenhagen, December, 2009*, pp. 129-161

21: March 31 (W): Team Project 3: "Quantitative Look at Combustion Reactions"

Henderson, *Climate Change*, pp. 172 ff.

22. April 5 (M): Opening Session of the Conference of Parties: United Nations Climate Change Conference. : Danish Prime Minister, presides; opening statements

Recommended Readings, depending on role: Pew Center Reports for 2007 are relatively unbiased: www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html; critics of climate change thesis should refer to the Center for the Study of CO₂ and Global Change: www.co2science.org or, less radical, but still opposed to climate change: GlobalWarming : www.globalwarming.org

23: April 7 (W) General Debate:

24. April 12 (M) General Debate and Treaty Vote: Follow-Up Discussion: Climate Change since 2009

25. April 15 (W) LAST CLASS: Discussion: Applications to Covid-19

Final Reflection Project Due:

How do any of the three topics in this course inform your understanding of the relationship of scientific ideas and society? Do societies today resolve debates over scientific knowledge and societal priorities?

Final Exam: To be Scheduled