

The History of Science in Western Afro-Eurasia from Antiquity to the Scientific Revolution

CLAS 190g / HIST 190g. *Department of Classics, University of Southern California, Fall 2021*
General Education – Social Analysis

Lecture: MW 8:30–9:50am, in Taper Hall ([THH](#)) 116

Discussion Sections:

- section 19896R (Fri. 10:00-10:50am), in DMC 209
- section 19897R (Fri. 11:00-11:50am), in SOS B37

Professor Alexandre Roberts (rob941@usc.edu)

Office hours: Mondays 12:00-1:50pm, in PED 132C (enter [through entrance opposite Bovard](#)).

Teaching Assistant: Harry Strawson (hstrawso@usc.edu)

Office hours: Wednesdays 12:00-1:50pm in PED 130U (use the [same entrance](#))

What is science, and what does it mean to do science? How do scientific ideas take shape, develop over time, and impact a wider society? This introductory course tackles these basic questions from a historical perspective by focusing on pre-modern science, primarily in western Eurasia and North Africa. Drawing on cutting-edge research in the history and sociology of science, we will fundamentally rethink received narratives, like the story that science was born in ancient Greece, all but vanished during the dark ages, and was then “rediscovered” by Europeans in the late Middle Ages and the early modern period. We will treat science as the messy social and intellectual processes actually practiced and experienced by scientists, rather than the simplified story of disembodied “discoveries” combining to form the linear progress often reported in introductory scientific textbooks, when such textbooks address the history of their disciplines at all.

The course will generally proceed chronologically, from the ancient Near East, ancient Greece, and the Greco-Roman and Persian Empires through Late Antiquity, to the Islamic world, Byzantium, and the Latin West in the medieval and early modern periods, ending in the seventeenth century. Disciplines that we will trace across this time span include astronomy, physics, chemistry, and medicine. Along the way, we will explore a series of thematic topics, including the role of imperial ideologies, gender, technology, textual practices, translation, and notions of the “occult” in scientific practice.

This course, satisfying the GE Social Analysis requirement, will engage intensively with recent work in the sociology of scientific knowledge. Sociological theories will be used as a lens through which to view evidence and narratives of past knowledge-production, and those qualitative data will conversely be used to assess the plausibility and applicability of sociological theories. This approach is meant to provide the means for the next generation of scientists, humanists, and educated citizens to develop their own historically-conscious understanding of what science is and has been, to help them navigate a world in which the

natural sciences and technology are often held up as the ultimate arbiters of a wide range of social, economic, and political issues—and just as often ignored and dismissed when their core findings challenge cherished notions or lucrative fictions.

COURSE OBJECTIVES (GE-C OBJECTIVES ITALICIZED)

This course will teach students to *apply methods of social analysis* from the sociology and anthropology of scientific knowledge *to the study of human behavior and experience* in the production, cultivation, dissemination, and study of science.

Through select readings in the primary sources, students will learn to work with the wide-ranging but fragmentary textual, visual, and material evidence that survives from centuries and millennia past; to understand *the nature* of this rich but often problematic *empirical evidence*; and to *assess the usefulness of such qualitative evidence in explaining* science and scientific practice as a *social phenomenon*, while at the same time taking it seriously as a method or range of methods for the systematic production of knowledge about the world.

Essential to this endeavor will be learning to take into account and understand *the interplay between human action* (such as empirical observation, formulating theories to explain observation, communicating theories and observations to others) and *organizations, institutions, and social and cultural settings* (from schools and universities to imperial courts and the wider circles of elite and non-elite populations who took an interest in scientific activity).

COURSE REQUIREMENTS

Readings: The assigned readings are key to success in this class. They are all required. Read them in a distraction-free environment, taking hand-written notes on key information, concepts, terms, and your own critical reactions. Make sure to complete the assigned reading *before* the lecture or discussion section under which it is listed.

Lectures: Attendance at all lectures is required. Please keep your electronics stowed (laptops, phones, etc.). Active listening and diligent note-taking (ideally by hand in a bound notebook) are key to doing well on the exams and essays.¹

Discussion section: Attendance and active, constructive participation at the weekly discussion section is also required. Please keep any electronics stowed during these class sessions as well. Discussion sections will focus on readings in primary sources for the history of science in order to provide a hands-on understanding of how historians interpret these texts and to connect the readings to the course's main themes.

Essays (in class): Two in-class essays (handwritten) will each develop an original, focused thesis relating to the history of science, based on a *close reading* of a primary source. Several possible topics will be provided, along with the primary source passages that you will be asked to analyze.

¹It is worth considering *how* to take notes most effectively. Note-taking is different from stenography. The aim is not to record every word but rather briefly to record key points, questions, and reactions that will help you as you study and review the material. Relevant advice (aimed at engineering students but also applicable to students in this course) may be found online: [“Effective Note-taking in Lectures.”](#)

In order to prepare for these essays, shorter **ungraded in-class writing exercises** will be assigned throughout the semester based on the day's reading assignment; these assignments will not count towards your grade, but the feedback you receive on these assignments will help you prepare for the longer, graded writing assignments.

Map Quiz: One map quiz will test your knowledge of the geography of western Afro-Eurasia, focusing on the Eastern Mediterranean, North Africa, and the Middle East. A study guide will be provided.

Exams: The **midterm** and **final** exams will test students' familiarity with and ability to think critically about the history of science and our sources for it, and to use this qualitative dataset to assess models of human knowledge-production. Your notes from the readings and lectures will be essential for preparing for these exams.

GRADING

The relative weight of each of these components in determining the final grade is as follows (for a total of 100% = 1000 points):

- Participation: 10% [100 points]
- Essay 1: 20% [200 points]
- Essay 2: 20% [200 points]
- Map Quiz: 5% [50 points]
- Mid-term Exam: 20% [200 points]
- Final Exam: 25% [250 points]

ELECTRONICS POLICY

Please do not use electronics (laptops, smartphones, etc.) during lecture or discussion section. This will allow you to focus on the course material free of distractions. Accordingly, students are required to bring a hard copy of each reading to class.

GRADING SCALE

Minimum numerical grade required to earn each letter grade:

93 = A || 90 = A- || 88 = B+ || 83 = B || 80 = B- || 78 = C+ || 73 = C || 70 = C- || 60 = D

BOOK (REQUIRED)

The following required book (HARD COPY required) may be purchased from the USC Bookstore (or new or used [online](#)):

- David C. Lindberg, *The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious, and Institutional Context, Prehistory to A.D. 1450*, 2nd ed. (Chicago: University of Chicago Press, 2007). ISBN [9780226482057](#)

All other readings are available as e-books linked from the [ARES Course Reserves](#), open-access resources, or, when not otherwise specified, on the Brightspace course site. In the case of those

PDFs, please *print out a hard copy* of all of them and *bring your hard copy of the assigned reading to each class*.

ADDITIONAL BOOKS ON RESERVE (OPTIONAL FURTHER READING)

Various sourcebooks and other resources may be found through the [ARES Course Reserves](#), some as physical books on reserve at the library, others as electronic resources.

RESOURCES

- *Oxford Classical Dictionary*
- *Oxford Dictionary of Byzantium*
- *Encyclopaedia of Islam*, 2nd edition
- USC Library's research guides on [Classics](#) and the [Middle East](#)

ACADEMIC HONESTY

It is a firm expectation that in all participation and submissions you will only represent as your own work, ideas, and writing that which is entirely your own. Any words that are not your own (including those generated by a Large Language Model a.k.a. "AI") must be enclosed in quotation marks and clearly attributed to the source where you obtained them.

This is not only crucial for fair evaluation of all students' work but also lies at the core of the human intellectual and ethical endeavor embodied by the University. Plagiarizing, cheating, and other forms of academic dishonesty will not be tolerated.

If in doubt, ask me or your TA.

USC's statement on Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

DISABILITY-RELATED ACCOMMODATIONS

In order to receive disability-related academic accommodations, students must first be registered with the Office of Disability Services and Programs (<http://dsp.usc.edu>). Faculty must be notified of registered students' accommodations before accommodations can be provided. Students who have a disability are invited to contact Disability Services as soon as possible.

SCHEDULE

Readings are listed for each lecture and discussion section next to bullet points. (M = Monday; W = Wednesday.)

Week 1

M 8/26: *Lecture 1*. Introduction. What is science? What is history? Why science in western Afro-Eurasia?

W 8/28: *Lecture 2*. What does it mean to do science? How do we (or should we) tell the history of science? What is at stake?

- Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 3rd ed. (Chicago: University of Chicago Press, 1996), chapters I, II

Discussion:

- Kuhn, *Structure*, chapter III

Week 2

M 9/2: LABOR DAY - NO LECTURE

W 9/4: *Lecture 3*. Sociology of science.

- Barry Barnes, *T. S. Kuhn and Social Science* (London: Macmillan, 1982), 1–15

Discussion: reading from this week's lecture.

Week 3

M 9/9: *Lecture 4*. The Scientific Method.

- Jessica Riskin, "Just Use Your Thinking Pump!," review of *The Scientific Method: An Evolution of Thinking from Darwin to Dewey*, by H. M. Cowles, *New York Review of Books*, 2 July 2020.

W 9/11: *Lecture 5*. The Ancient Near East and Egypt.

- Lindberg, *Beginnings*, chapter 1 (Science before the Greeks)

Discussion:

- Francesca Rochberg, *Before Nature: Cuneiform Knowledge and the History of Science* (Chicago: University of Chicago Press, 2016), ONLY THE BLOCK QUOTES on pp. 206–7, 209–10, 212, 223, 267, 270 | reading available on Brightspace; whole book linked at [ARES](#)

Week 4

M 9/16: *Lecture 6*. Ancient Greece (MAP QUIZ at the beginning of class.)

- Lindberg, *Beginnings*, chapter 2 (The Greek and the Cosmos)

W 9/18: *Lecture 7*. Philosophy, Technology, Science

- Lindberg, *Beginnings*, chapter 3 (Aristotle's Philosophy of Nature)

Discussion:

- Georgia L. Irby-Massie and Paul T. Keyser, *Greek Science of the Hellenistic Era: A Sourcebook* (London: Routledge, 2002), 3.3 (Aristarchos, astronomy), 3.19 (Ptolemy, astronomy), 6.11 (Heron of Alexandria, *Pneumatics* 1.43 only = pp. 175–76 on the organ), 7.4 (Diokles, burning-mirrors) | selection on Brightspace site; whole book on [ARES](#)

Week 5

M 9/23: *Lecture 8*. After Aristotle

- Lindberg, *Beginnings*, chapter 4 (Hellenistic Natural Philosophy)

W 9/25: *Lecture 9*. Science and Mathematics

- Lindberg, *Beginnings*, chapter 5 (The Mathematical Sciences in Antiquity)

Discussion:

- Andrew N. Sherwood et al., *Greek and Roman Technology: A Sourcebook of Translated Greek and Roman Texts*, 2nd ed. (Abingdon, Oxon: Routledge, 2020), 221–233, 238–241, 246–248 = selections from Ch. 6, “Metallurgy” | [ARES](#)

Week 6

M 9/30: *Lecture 10*. Medicine, Physics, and Chemistry

- Lindberg, *Beginnings*, chapter 6 (Greek and Roman Medicine)

W 10/2: *Lecture 11*. Roman Empire to the Early Middle Ages, or: What about the Dark Ages?

- Lindberg, *Beginnings*, chapter 7 (Roman and Early Medieval Science)

Discussion:

- Galen, *Mixtures*, 2.1, trans. Singer and van der Eijk, pp. 103–7 (skip the footnotes) | Brightspace site

Week 7

M 10/7: *Lecture 12*. Science and the Occult

- Wouter J. Hanegraaff, *Western Esotericism: A Guide for the Perplexed* (London: Bloomsbury Academic, 2013), vi–vii, 1–17

W 10/9: **Essay 1** (in class)

No discussion section this week. (Fall Recess: Thursday and Friday.)

Week 8

M 10/14: *Lecture 13*. Women in Science

- Hannah Wills et al., eds., *Women in the History of Science: A Sourcebook* (London: UCL

Press, 2023), chapters 3, 5, 7 | [open access](#)

W 10/16: **MID-TERM EXAM** (in class)

No discussion section this week.

Week 9

M 10/21: *Lecture 14*. Byzantine Science

- Maria Mavroudi, “Science, Byzantine,” in *The Encyclopedia of Ancient History*, ed. Roger S. Bagnall et al. (Blackwell, 2013), 6063–6065
- Anna Comnena, *Alexiad*, prologue

W 10/23: *Lecture 15*. Greek Science into Arabic... and Arabic Science into Greek

- Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early ‘Abbāsīd Society, 2nd–4th/8th–10th centuries* (London: Routledge, 1998), 1–8, 107–120 | [ARES](#)

Discussion:

- Nikephoros Blemmydes, treatise on gold-making by means of eggs, trans. Shannon Steiner

Week 10

M 10/28: *Lecture 16*. From Alchemy to Chemistry?

- ps.-Democritus, *The Four Books of Pseudo-Democritus*, ed./trans. M. Martelli (2013), 78–103 (odd pages only)
- Ibn Sīnā, *Shifā’*, excerpt on the question of transmutation (1 page)

W 10/30: *Lecture 17*. Islamic Science

- Lindberg, *Beginnings*, chapter 8 (Islamic Science)

Discussion:

- Banū Mūsā (?), critique of Ptolemy’s cosmology, translated by George Saliba, “Early Arabic Critique of Ptolemaic Cosmology: A Ninth-Century Text on the Motion of the Celestial Spheres,” *Journal for the History of Astronomy* 25 (1994): 131–137 (odd pages only)

Week 11

M 11/4: *Lecture 18*. What about western Europe?

- Lindberg, *Beginnings*, chapter 9 (The Revival of Learning in the West)

W 11/6: *Lecture 19*. Rebirth or new cultural centers?

- Lindberg, *Beginnings*, chapter 10 (The Recovery and Assimilation of Greek and Islamic Science), i.e., in western Europe

Discussion:

- Edward Grant, *A Source Book in Medieval Science*, Source Books in the History of the Sciences (Cambridge, MA: Harvard University Press, 1974), selections

Week 12

M 11/11: NO CLASS (Veterans Day)

W 11/13: *Lecture 20*. Astronomy and Cosmology

- Lindberg, *Beginnings*, chapter 11 (The Medieval Cosmos)

Discussion:

- Ptolemy, *Almagest*, 1.1–7, pp. 35–45
- Naṣīr al-Dīn al-Ṭūsī, *Memoir on Astronomy (al-Tadhkira fī ‘ilm al-hay’a)*, ed. and trans. F. Jamil Ragep, 2 vols. (New York: Springer, 1993), Preface, I.Intro–1, II.13 (pp. 90–98, 228–238, odd pages only)

Week 13

M 11/18: *Lecture 21*. Physics

- Lindberg, *Beginnings*, chapter 12 (The Physics of the Sublunar Region)

W 11/20: **Essay 2** (in class)

Week 14

M 11/25: *Lecture 22*. Science in the Late Byzantine Period, the Ottoman Empire, and the European Renaissance. Continuity and Change in Scientific Traditions

- George Saliba, *Islamic Science and the Making of the European Renaissance* (Cambridge, MA: MIT Press, 2007), 1–25 | [ARES](#)

W 11/27: NO CLASS (Thanksgiving break)

No discussion section.

Week 15

M 12/2: *Lecture 23*. The Scientific Revolution, Rejected Knowledge, and Science Ignored

- Steven Shapin, *The Scientific Revolution* (Chicago: University of Chicago Press, 1996), 1–14 (intro)

W 12/4: *Lecture 24*. Pre-modern Science and the Modern Imagination

- Bruno Latour, *An Inquiry into Modes of Existence: An Anthropology of the Moderns* (Cambridge, MA: Harvard University Press, 2013), 28–37

Discussion: final discussion section, no additional readings.

Final Exam

Wednesday, December 11, 2024 | 8-10 a.m

Support Systems

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call.

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call.

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call.

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086.

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-5086 or (213) 821-8298.

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776.

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411.

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101.

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call.

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call.

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC).

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu.

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.