

Bibliography

Essential Readings:

Note: The following texts can be considered the general “textbooks” and important primary sources for the course; they are intended to provide a set of more or less continuous readings relating to the lectures. However, the material covered in some of the lectures does not appear in these books; the supplementary readings below furnish more specific information—usually at a somewhat higher level.

Barnes, Jonathan. *Aristotle: A Very Short Introduction*. Oxford: Oxford University Press, 2000. This is the best quick introduction to Aristotle available; excellent overview and analysis.

Debus, Allen G. *Man and Nature in the Renaissance*. Cambridge: Cambridge University Press, 1978. A slim work intended as a textbook, covers material for Lectures Twenty-Four to Thirty-Three.

Finocchiaro, Maurice A. *The Galileo Affair: A Documentary History*. Berkeley: University of California Press, 1989. Contains not only translations of *all* the documents relating to Galileo’s trials, but also an introduction with the most concise and balanced overview of the whole affair.

Galileo. *Sidereus Nuncius*, trans. Albert van Helden. Chicago: University of Chicago, 1989. Galileo’s announcement of his telescopic discoveries; highly readable way to encounter primary sources.

Grant, Edward. *The Foundations of Modern Science in the Middle Ages*. Cambridge: Cambridge University Press, 1996. A clear and comprehensive textbook for the Latin medieval section of the course, Lectures Thirteen and Seventeen through Twenty-Three; especially good on the subjects of the Latin translation movement, universities, and medieval physics and cosmology.

Gutas, Dimitri. *Greek Thought, Arabic Culture*. London: Routledge, 1998. There are no textbooks in English dealing with the history of Arabic science; however, this book gives an excellent, up-to-date, and insightful analysis of the adoption of Greek learning in the Islamic world, even though the level of discussion is somewhat high for a beginning student.

Henry, John. *The Scientific Revolution and the Origins of Modern Science*, 2nd ed. London: Palgrave, 2002. An outstanding and very short survey of seventeenth-century science. It is massively and unobtrusively referenced with the most up-to-date sources and, thus, can be a jumping-off point for further study of specific topics. Because it does not run in the same order as the lectures, I suggest that listeners read the whole thing through after Lecture Thirty-Five as a summary review of Lectures Twenty-Four to Thirty-Five.

Lindberg, David C. *The Beginnings of Western Science*. Chicago: University of Chicago Press, 1992. A good and thorough textbook designed for

undergraduates, used here as a mainstay of the first two units (Lectures One through Twenty-Four).

Lloyd, G. E. R. *Early Greek Science: Thales to Aristotle*. New York: Norton, 1970. The author is the accepted authority on ancient Greek scientific thought; excellent introduction to the content of Greek thought about the natural world.

———. *Greek Science after Aristotle*. New York: Norton, 1973. See the previous comment.

Plato. *Timaeus and Critias*, trans. Desmond Lee. New York: Penguin Classics, 1977. Good readable translation of the *Timaeus*.

Westfall, Richard S. *The Construction of Modern Science: Mechanisms and Mechanics*. Cambridge: Cambridge University Press, 1977. Parts of this work are quite dated now, but it still contains a good presentation of the essentials of the mechanical philosophy.

William of Conches. *A Dialogue on Natural Philosophy (Dragmaticon Philosophiae)*, ed. Italo Ronca and Matthew Curr. South Bend, IN: University of Notre Dame Press, 1997. A very readable translation that provides a fine sense of the style and motivation of a (non-Scholastic) medieval treatise on natural philosophy.

Supplementary Readings:

Applebaum, Wilbur, ed. *Encyclopedia of the Scientific Revolution: From Copernicus to Newton*. New York: Garland Publishing, 2000. An extremely useful reference source for the third unit of this course, hundreds of concise, up-to-date entries written by leading scholars and intended for students. If you want to acquire one reference source for the history of the Scientific Revolution, this is it.

Aristotle. His entire corpus appears in the Loeb Classical Library editions where the translations run the gamut from good to bad in terms of readability and accuracy. There are a slew of Aristotle translations out there, and it is probably best to buy or borrow them like shoes—try them on, walk around a bit, and, if they seem uncomfortable, there is probably another one to try on. Also try a “reader” which contains “key” selections from Aristotle’s writings; there are quite a few available, see below, for example, Irwin and Fine.

Ashworth, William B., Jr. “Natural History and the Emblematic World View,” in *Reappraisals of the Scientific Revolution*, edited by David C. Lindberg and Robert S. Westman, pp. 333–365. Cambridge: Cambridge University Press, 1990. A clear exposition of the changes in the way the natural world and its objects were viewed in the Renaissance.

Augustine. *The Confessions*, trans. by R. S. Pine-Coffin. New York: Penguin Books, 1961. Most readable translation of this important work; easily available. Follow St. Augustine on his circuit of the late classical world. Between the pious exclamations, this book gives a vivid view of the intellectual/ philosophical

marketplace of 400 A.D. and St. Augustine's real indebtedness to classical thought.

Bacon, Francis. *Selected Philosophical Works*, ed. Rose-Mary Sargent. Indianapolis, IN: Hackett, 1999. Good translation and collection, containing selections from most of Bacon's works that deal most closely with his method and his impact on the history of science.

Benson, Robert L. and Giles Constable, eds. *Renaissance and Renewal in the Twelfth Century*. Toronto: University of Toronto Press, 1999. A recent and lengthy work updating the classical study by Haskins. It consists of twenty-six papers which cover the broad range of subjects which underwent dramatic change during the twelfth century.

Cadden, Joan. "Science and Rhetoric in the Middle Ages: The Natural Philosophy of William of Conches," *Journal of the History of Ideas* 56, (1995): 1–24. Fine contextualization and exposition on the primary reading listed above from William of Conches.

Casson, Lionel. *Libraries in the Ancient World*. New Haven: Yale University Press, 2001. Very readable overview of the development of libraries in antiquity.

Copenhagen, Brian P. "Natural Magic, Hermeticism, and Occultism in Early Modern Science," in *Reappraisals of the Scientific Revolution*, edited by David C. Lindberg and Robert S. Westman, pp. 261–301. Cambridge: Cambridge University Press, 1990. Important analysis of how natural magic functioned in the Renaissance and clarification of the role of the Hermetic corpus; fairly high level but fascinating.

———. *Hermetica: The Greek Corpus Hermeticum and the Latin Asclepius in a New English Translation with Notes and Introduction*. Cambridge: Cambridge University Press, 1992. Best translation of the Hermetic corpus, with an extremely detailed and expert introduction.

Copernicus, Nicolas. *On the Revolutions*, tr. by Edward Rosen. Baltimore: Johns Hopkins Press, 1978. An excellent translation of *De revolutionibus*, including all the important front matter and with a helpful introduction and annotations.

Crombie, A. C. *Robert Grosseteste and the Origins of Experimental Science, 1000–1700*. Oxford: Clarendon Press, 1953. Slightly dated at some points but still a clear exposition of Grosseteste's work and influence.

Dawson, Christopher. *Mission to Asia*. Toronto: University of Toronto Press, 1998. Very readable translations of the original accounts compiled by the Franciscan friars who journeyed to Mongolia in the middle of the thirteenth century. Absolutely fascinating.

Dear, Peter, ed. *The Scientific Enterprise in Early Modern Europe: Readings from Isis*. Chicago: University of Chicago Press, 1996. A collection of over a dozen articles from *Isis*, the journal of the History of Science Society. The volume makes a good "reader" for those interested in more advanced and

detailed discussions of particular events or characters of the Scientific Revolution. (See the similar reader volume by Shank, ed., below.)

Dhanani, Alnoor. *The Physical Theory of Kalam: Atoms, Space and Void in Basrian Mu'tazili Cosmology*. Leiden: Brill, 1994. Fascinating analysis of atomistic doctrines among the early *mutakallimūn*; a difficult text to be sure (it began as a Ph.D. dissertation), but so is the topic. Provides considerable reward to a patient and committed reader.

Dibner, Bern. *Moving the Obelisks*. Norwalk, CT: Burndy Library, 1991. Short and entertaining study of the moving of obelisks from antiquity to the modern era; profusely illustrated, including fold-out plates that are facsimiles from Fontana's sixteenth-century account of moving the Vatican obelisk.

Dick, Steven J. *Plurality of Worlds: The Origins of the Extraterrestrial Life Debate from Democritus to Kant*. Cambridge: Cambridge University Press, 1982. Fascinating account of the varied historical views on the possibility of extraterrestrial life.

Dobbs, Betty Jo Teeter. *The Janus Faces of Genius: The Role of Alchemy in Newton's Thought*. Cambridge: Cambridge University Press, 1991. An attempt to synthesize the disparate elements of Newton's interests and activities into a unified portrait of his scientific motivations.

———. "Newton as Final Cause and First Mover," *Isis* 85 (1994): 633–643. The text of the Distinguished Lecture given by this expert on Newton's alchemy to the History of Science Society in 1993. This short paper is extremely readable for all students of this course and does a fine job of summarizing the groundbreaking reevaluation of Newton's position in the history of science (particularly in regard to his alchemy and theology) advanced by Dobbs.

Eamon, William. "Technology as Magic in the Late Middle Ages and the Renaissance," *Janus* 70 (1983): 171–212. A very interesting view of the "wonderful" aspect of technology, with excellent examples and illustrations, written in an engaging style.

Galileo. *Dialogue on the Two Chief World Systems*. There are two translations currently available. The older one by Stillman Drake is *Dialogue Concerning the Two Chief World Systems, Ptolemaic and Copernican*. New York: Modern Library, 2001. A newer translation and abridgement along with helpful up-to-date commentary is by Maurice Finocchiaro, *Galileo on the World Systems: A New Abridged Translation and Guide*. Berkeley: University of California Press, 1997.

Galileo, *Two New Sciences*, tr. Henry Crew and Alfonso de Salvio. New York: Dover, 1954. An older translation, but readable and widely available in many editions.

Gies, Frances, and Joseph Gies. *Cathedral, Forge and Waterwheel: Technology and Invention in the Middle Ages*. New York: Harper/Collins, 1994. A fine work for the general reader covering late classical and medieval technology.

Gilbert, William. *On the Magnet*. New York: Basic Books, 1958. An older translation but readable and widely available in many editions.

Grafton, Anthony. *Cardano's Cosmos: The Worlds and Works of a Renaissance Astrologer*. Cambridge, MA: Harvard University Press, 1999. View of the life and thought of an important Renaissance figure.

Grant, Edward, ed. *A Source Book of Medieval Science*. Cambridge, MA: Harvard University Press, 1974. May be a little difficult to find but contains more than a hundred translated excerpts from medieval authors (Latin and Arabic) with annotations and commentary. Particularly strong in cosmology and physics.

Hare, R.M. *Plato*. Oxford: Oxford University Press, 1996. A very brief survey of Plato's ideas. The author is a moral philosopher, and so his analysis centers more on aspects of Plato's thought than on topics strictly of interest to the historian of science.

Haskins, Charles H. *The Renaissance of the Twelfth Century*. Cambridge, MA: Harvard University Press, 1927. The classic work on the subject. Frequently reprinted and easily available; covers a wide range of topics in twelfth-century history, not just history of science.

Hellman, C. Doris. *The Comet of 1577: Its Place in the History of Astronomy*. New York: AMS Press, 1971. Analysis of the importance of comet observations by Tycho and others and how they affected the prevailing Aristotelian view of the cosmos.

Hugh of St. Victor. *Didascalicon*, ed. Jeremy Taylor. New York: Columbia University Press, 1991. Good primary source in which to sample the heights reached by the Platonic strain of Christian thought and the emphasis placed on education by the medieval Christian schools. Can be a bit difficult to penetrate at points, but rewarding (and provocative!) to the patient modern reader.

Huizinga, Johan. *The Autumn of the Middle Ages*. Chicago: University of Chicago Press, 1996. A classic, dealing predominantly with art history yet useful for the student of this course in terms of creating the cultural atmosphere at the end of the "Middle Ages."

Hutchison, Keith. "What Happened to Occult Qualities in the Scientific Revolution?" *Isis* 73 (1982): 233–253. Provides an excellent description of the meaning and identity of "occult qualities" in late Aristotelian thought and their often-surprising fate in the Scientific Revolution, including the co-opting of such qualities by the mechanical philosophy. (Also reprinted in the Dear collection, above.)

Irwin, Terence and Gail Fine. *Aristotle: Selections*. Indianapolis: Hackett Publishing, 1995. Reading all the way through any one work by Aristotle on one's own takes a bit of fortitude; this book provides important selections from about fifteen of Aristotle's books. The range includes his logic and ethics, but also selections from some of *libri naturales* (but, unfortunately, nothing from *On the Heavens*). The translations are generally good and readable.

Kahn, Charles H. *The Art and Thought of Heraclitus*. Cambridge: Cambridge University Press, 1979. Detailed analysis and text (Greek and English) of each fragment surviving from my favorite Presocratic philosopher.

Kargon, Robert H. *Atomism in England from Harriot to Newton*. Oxford: Clarendon Press, 1966. Analysis of the various atomistic views in England with brief biographical sketches of their promoters—excellent for following the history of this important idea in England up to Newton.

Kirk, G. S., J. E. Raven, and M. Schofield. *The Presocratic Philosophers*. Cambridge: Cambridge University Press, 1983. One of the classic works on the Presocratics: texts, translations, and analyses. Hard to read through, more a work of reference. (See Wheelwright, below.)

Landels, J. G. *Engineering in the Ancient World*. Berkeley: University of California Press, 1981. Emphasis on hydraulic engineering, weapons, and modes of transport in the ancient world. Overview of the technological work found of Hero, Vitruvius, Frontinus (first century A.D. waterworks engineer for the city of Rome), and Pliny.

Lawrence, C. H. *The Friars*. London: Longmans, 1994. Account of the origin and work of the Dominicans and Franciscans in the Middle Ages.

Leff, Gordon. *Paris and Oxford Universities in the Thirteenth and Fourteenth Centuries*. Huntington, NY: Krieger Publishing, 1975. The standard work on the medieval university; detailed analysis of the origins of the northern universities, fascinating detail about curricula and student life, as well as intellectual developments at each locale.

Lindberg, David C. *Roger Bacon's Philosophy of Nature*. Oxford: Clarendon Press, 1983. Critical editions and translations of Roger Bacon's works *On the Multiplication of Species* and *On Burning Mirrors*, together with biographical material on Bacon and analysis of his intellectual development and contributions. Bacon's text can be quite challenging for a twenty-first century reader, but brush up on your medieval Aristotelian terminology and optics and plunge in!

Lindberg, David C., ed. *Science in the Middle Ages*. Chicago: University of Chicago Press, 1978. A collection of essays by eminent scholars on medieval history of science; essays cover technology, the translation movement, the universities, mathematics, physics, cosmology and astronomy, optics, medicine, natural history, magic, and more.

Lindberg, David C., and Robert S. Westman. *Reappraisals of the Scientific Revolution*. Cambridge: Cambridge University Press, 1990. A collection of essays by eminent scholars intended to reevaluate common views of the development of sixteenth- and seventeenth-century science. Generally at a high level, but most articles are quite accessible and are very useful for further developing points brought forth in the lectures.

Lindberg, David C., and Ronald L. Numbers. *God and Nature: Historical Essays on the Encounter between Christianity and Science*. Berkeley: University

of California Press, 1986. Collection of essays on the relationship between science and religion from the Patristics to twentieth-century creationism.

Long, Pamela O. "Humanism and Science" in *Renaissance Humanism: Foundations, Forms, and Legacy*, ed. Albert Rabil, Jr. Philadelphia: University of Pennsylvania Press, 1988, vol. 3, pp. 486–512. Readable and erudite overview of the role of humanism in early modern science, analyzing the various scholarly views of the role of humanism in science.

———. *Technology, Society, and Culture in Late Medieval and Renaissance Europe, 1300-1600*. Washington, D.C.: SHOT/AHA, 2000. An excellent, brief (77 pages), illustrated, and highly readable text on aspects of early modern technology—from mining and gunnery to textiles, agriculture, and sculpture. Part of a series of short monographs on technology (priced at just \$8!) available at www.theaha.org.

McEvoy, James. "The Metaphysics of Light in the Middle Ages," *Philosophical Studies* 26 (1979): 126–145. High-level text but important in terms of an introduction to a difficult but important feature of medieval thought—in natural philosophy and elsewhere.

Neugebauer, Otto. *The Exact Sciences in Antiquity*. New York: Dover, 1969. A classical work dealing with Babylonian, Egyptian, and Greek mathematical and astronomical texts. This book can be tough slogging, most useful for those with a good grasp of astronomy and mathematics to start with. Emphasizes scientific content over cultural context.

Newman, William R. "Technology and Alchemical Debate in the Middle Ages," *Isis* 80 (1989): 423–445. A fascinating article that argues for alchemy's bold (and modern-sounding) claims for the power of human artifice over nature. (Also in the Shank reader, below.)

North, John. *The History of Astronomy and Cosmology*. New York: Norton, 1995. An outstanding survey of the history of astronomy from prehistory to the modern era. Lucidly organized and written, exhaustive in coverage, and masterful in presentation, North's work has become a standard source. If you want one book to use as reading and reference in the history of astronomy, choose this one.

Osler, Margaret J. "How Mechanical Was the Mechanical Philosophy? Non-Epicurean Aspects of Gassendi's Philosophy of Nature," in *Late Medieval and Early Modern Corpuscular Matter Theories*, edited by Christoph Lüthy, John Murdoch, and William Newman, pp. 423–439. Leiden: Brill, 2001. A very clear and interesting analysis of Gassendi's mechanical system and its "non-mechanical" elements.

———. *Rethinking the Scientific Revolution*. Cambridge: Cambridge University Press, 2000. A collection of essays dealing with various aspects of the current reevaluation of the concept and content of the Scientific Revolution, beginning with a spirited debate between Westfall and Dobbs, scholars cited in various places throughout this course.

Plato. *Republic*. There are a huge number of translations of this important work available, many with commentaries of greater or lesser value. The most important section for historians of science is Book VII, which contains the "Parable of the Cave," a key exposition of Plato's ontology and epistemology.

Pliny. *Natural History*. New York: Penguin, 1991. Representative selection of some of the more entertaining sections of Pliny's encyclopedic work. If you want the whole thing, try the Loeb Classical Library edition.

Principe, Lawrence M. *The Aspiring Adept: Robert Boyle and His Alchemical Quest*. Princeton, NJ: Princeton University Press, 1998. Treatment of the previously oft-hidden alchemical preoccupations of Boyle; includes two provocative (and hitherto unpublished) texts by Boyle on alchemy.

Principe, Lawrence M., and William R. Newman. "Some Problems in the Historiography of Alchemy," pp. 385–434 in *Secrets of Nature: Astrology and Alchemy in Early Modern Europe*, edited by Anthony Grafton and William Newman, pp. 385–434. Cambridge, MA: MIT Press, 2001. Debunks four widespread popular misconceptions about the subject of alchemy and shows the origins of these misconceptions.

Ptolemy. *Tetrabiblos*, trans. Frank Egleston Robbins. Cambridge, MA: Harvard University Press, 1980. Part of the Loeb Classical Library series, presented with Greek and English on facing pages. This is the classical source for the astrological tradition and is surprisingly readable.

Ross, Sydney. *Nineteenth-Century Attitudes: Men of Science*, chapter 1: "Scientist: The Story of a Word." Dordrecht: Kluwer Academic Publishers, 1991. Amusing history of the coinage and slow acceptance of the word "scientist"—will greatly surprise most readers.

Sabra, A. I. "Greek Science in Islam," *History of Science* 25 (1987): 223–243. Thoughtful piece on the translation movement and the fate of Greek science in the Arabic world.

———. "Situating Arabic Science: Locality versus Essence," *Isis* 87 (1996): 654–670. Probes the reasons behind the Arabic embrace of Greek learning and briefly explores the cause of the decline of Arabic science, with a plea for more scholarly attention to be paid to this important and understudied area.

Shank, Michael H., ed. *The Scientific Enterprise in Antiquity and Middle Ages: Readings from Isis*. Chicago: University of Chicago Press, 1996. A collection of twenty-two articles from *Isis*, the journal of the History of Science Society. The volume makes a good "reader" for those interested in more advanced and detailed discussions of particular events, topics, or characters from antiquity and the Middle Ages. (See the similar reader volume by Dear, ed., above.)

Stahl, William Harris. *Roman Science: Origins, Development, and Influence to the Later Middle Ages*. Madison, WI: University of Wisconsin Press, 1962. There's not a great deal of material on Roman science available; this is the classic study.

Stroup, Alice. *A Company of Scientists: Botany, Patronage, and Community at the Seventeenth-Century Parisian Royal Academy of Sciences*. Berkeley, CA: University of California Press, 1990. An excellent view of this important scientific society during its early years of the seventeenth century. The first five chapters give a fine overview of the structure and founding of the Académie; the balance deals with more specific issues—particularly in botany and chemistry—as illustrations of the society.

Theophilus. *On Divers Arts*, trans. John G. Hawthorne and Cyril Stanley Smith. New York: Dover, 1979. Want to know how to cast a bronze censer, build an organ, or construct a stained-glass window starting with sand, ashes, and lead? Then this eleventh-century text from a monastic workshop is the book for you.

Thoren, Victor E. *The Lord of Uraniborg: A Biography of Tycho Brahe*. Cambridge: Cambridge University Press, 1990. Can be difficult to read at times, but the standard biography of the Great Dane.

Westfall, Richard S. *Never at Rest: A Biography of Isaac Newton*. Cambridge: Cambridge University Press, 1980. Most complete and up-to-date biography of Isaac Newton. This is quite a massive volume; for those not wishing to read the whole thing, there is an abridged version at about a third the length.

Westman, Robert S. “Three Responses to the Copernican Theory: Johannes Praetorius, Tycho Brahe, and Michael Maestlin,” in *The Copernican Achievement*, edited by Robert S. Westman, pp. 285–345. Berkeley and Los Angeles: University of California Press, 1975. Important study of how Copernicus’ work was interpreted and used in the sixteenth century.

———. “Proof, Poetics, and Patronage: Copernicus’ Preface to *De revolutionibus*,” in *Reappraisals of the Scientific Revolution*, edited by David C. Lindberg and Robert S. Westman, pp. 167–205. Cambridge: Cambridge University Press, 1990. Interesting study of the publication of *De revolutionibus* and Copernicus’ humanism.

Wheelwright, Philip. *The Presocratics*. Indianapolis, IN: Bobbs-Merrill, 1960. Emphasis here is given to the fragments of the Presocratics themselves. The brief introductions to each author and his school are particularly useful. A better first book on this topic than Kirk and Raven, in my opinion.

Wilken, Robert L. *The Christians as the Romans Saw Them*. New Haven: Yale University Press, 1984. A book that “turns the tables” since the popular view of the Romans is often through Christian eyes; here, the (pagan) Romans get their turn. Interesting description of the development of early Christian theology as a response to learned pagan criticism.