

History of Science 903
Seminar: Galileo Galilei
Michael H. Shank
History of Science, UW-Madison, Spring 2008
Mondays 1:20-3:15

Office Hours: W 2:30-3:30 and by appointment (mhshank@facstaff.wisc.edu; office phone: 262-3972; dept fax: 262-3984)

Books

Stillman Drake, trans., *Discoveries and Opinions of Galileo* (Anchor, 1957). 0-385-09239-3
Stillman Drake, *Galileo at Work: His Scientific Biography* [1978] (New York: Dover, 1995) 0-486-28631-2 [find on web or get photocopy]
Maurice Finocchiaro, *Galileo on the World Systems: A New Abridged Translation and Guide*, trans and ed. by (Berkeley: U. of California Press, 1997) 0-520-20646-0
Richard J. Blackwell, *Galileo, Bellarmine, and the Bible* (Notre Dame: University of Notre Dame Press, 1987).
0-268-01027-7
Maurice Finocchiaro, ed., *The Galileo Affair* (Berkeley: Univ. California Press, 1989). 0-520-06662-6.
Dava Sobel, *Galileo's Daughter: A Historical Memoir of Science, Faith, and Love* (New York: Penguin, 1999).

Recommended reading: one other biography of Galileo of your choice (e.g.):

Ludovico Geymonat, *Galileo Galilei* (HSL)—philosophical/older
James Reston, Jr., *Galileo* (HarperCollins, 1994)--general reader
Michael Sharatt, *Galileo, Decisive Innovator* (Cambridge UP)—scholarly
Artigas and William Shea, *Galileo in Rome* (Oxford: Oxford University Press, 200X)
Ernan McMullin, ed., *The Church and Galileo* (Notre Dame: University of Notre Dame Press, 2005).

Requirements

This is a reading and discussion seminar, which will function only if participants are well prepared; doing the assigned readings on time is therefore very important, as is active participation by way of critical analysis, and informed questions and comments.

Framework for evaluation (negotiable)

- A) In-class contribution and participation in discussion (30%)
- B) one in-class 15 min. report cum book review of a significant book on Galileo (10%)
This is an exercise in teaching; clarity and intelligibility are at a premium.
- C) Writing (60%) ca. 25-30 pp. ; option of:
 - 1) three separate critical essay-reviews (8-10 pp. each) of substantive books on Galileo (check with me)

- suggested schedule: one due before break; one right after break; one at the end.
- 2) one substantive literature review on a given topic (to include several books and multiple articles)
 - 3) one research paper that emphasizes primary sources in their historiographical context.

I expect scrupulous honesty, esp. in written work. Treat your evidence and your opponents fairly by using quotation marks to distinguish the words of others from your own and by giving credit to the sources of your ideas. If you are unsure about proper citation practice, look at Wayne Booth *et al.*, *The Craft of Research* (Chicago, 1995) and the *Chicago Manual of Style*. If questions remain, contact me (in person, by phone, or by email).

Useful references that are easy to overlook: note the chronology in *The Galileo Affair* (297-312) and the helpful casts of characters in *ibid* (313-324) and in *Galileo at Work*, 437-471. A superb guide to much Galileo material is the site of the Istituto e Museo di Storia della Scienza in Florence: <http://www.imss.fi.it/>

A reasonably reliable Galileo website is <http://es.rice.edu/ES/humsoc/Galileo/>

HSL (below) = History of Science Library, Social Science 7130. Many Galileo books are in the QB35 to QB41 sections; ditto for other LCC libraries.

Proposed Schedule

Week 1-2 (January 28): Introduction to Course/Sixteenth-Century Background
Aristotle/Plato/Archimedes

Readings: *Galileo on the World Systems*, pp. 1-38; S. Drake, "Vincenzio Galilei and Galileo," *Galileo Studies*, pp. 43-62 (HSL); Blackwell, *Galileo, Bellarmine*, ch. 1, Appendices 1-3, pp. 5-27, 181-194; Drake, *Galileo at Work*, ch. 1-2, pp. 1-32; Tim Carter, "Music and Patronage in Late Sixteenth-Century Florence: The Case of Jacopo Corsi, (1561-1602)" in *I Tatti Studies: Essays in the Renaissance* 1 (1985) 57-79 (skim notes and appendices); Shank, "Setting the Stage," (first part pp. 57-69 middle.

Recommended for general background (available in History of Science Reading Room): Thomas Kuhn, *The Copernican Revolution*, ch. 1-4; I. Bernard Cohen, *The Birth of a New Physics*; James Lattis, *Between Copernicus and Galileo: Christoph Clavius and the Collapse of Ptolemaic Cosmology* (Chicago: University of Chicago Press, 1994); Stillman Drake, *Galileo Galilei* (Oxford/Hill and Wang); Ludovico Geymonat, *Galileo Galilei: A Biography and Inquiry into his Philosophy of Science*

Week 3 (4 February): Interpretations of the Early Galileo and his Context

Readings: Skim Drake, "Galilei, Galileo," *Dictionary of Scientific Biography* (New York, 1970-80), V, 237-49 but READ Michele Camerota, "Galilei, Galileo," in *New Dictionary of Scientific Biography* (Detroit, 2008) III, 96-103; Galileo, *De motu* (trans. I. E. Drabkin) (Madison: University

of Wisconsin Press, 1960), beg. Ch. 8 (pp. 26-31); Galileo, *Memoranda on Motion* in Drake and Drabkin, eds., *Mechanics in Sixteenth-Century Italy* (Madison: University of Wisconsin Press, 1969), pp. 378-87; William A. Wallace, "Galileo's Pisan Studies in Science and Philosophy," in Peter Machamer, ed., *The Cambridge Companion to Galileo* (Cambridge: Cambridge University Press, 1998), 27-52 (handout); Ron Naylor, "Galileo, Copernicanism, and the Origins of the New Science of Motion," *British Journal for the History of Science* 36 (2003) 151-81 (handout); "Comrades in Pursuit of Truth," pp. 597-600 [Reader]; Galileo, *Operations of the Geometric and Military Compass* (Washington, D.C.: Smithsonian Press, 1978), browse introduction; study carefully the title page, the dedication and the preface (36-41); leaf through the rest.

Possible reports: Vincenzo Galilei and music, using the work of Claude Palisca and translations of V. Galilei's works; Charles Schmitt on Galileo's Pisan Years (see his *Variorum* reprint volumes); Galileo's *De motu* in relation to the Pisan and early Paduan contexts.

Week 4 (11 February): Pisa to Padua

?Experiment: inked ball on incline

Lindberg, *Beginnings of Western Science*, pp. 290-307; James Lennox, "Aristotle, Galileo, and the 'Mixed Sciences,'" in William Wallace, ed., *Reinterpreting Galileo* (Washington, D. C.: Catholic University of America Press, 1986), pp. 29-51; Domenico Bertoloni-Meli, "Mechanics," in Daston and Park, eds., *Cambridge History of Science*, vol. 3 (Cambridge, 2007), 632-53; Drake, *Galileo at Work*, ch. 3-7, pp. 33-133; Koyré, "Galileo and Plato," from his *Metaphysics and Measurement* (Harvard UP, 1968).

Possible reports: Galileo as a 'mechanic' or instrument-maker; William Wallace's work (esp. *Galileo and his Sources*); the Wallace-Crombie scuffle [see Crombie's co-authored article with Carugo, "The Jesuits and Galileo's Ideas of Science and of Nature," *Annali de' Istituto et Museo di Storia della Scienza di Firenze* viii.2 (1983); esp. at footnote 11, reprinted in the collection by Crombie, *Science, Art and Nature in Medieval and Modern Thought*, pp. 172 ff, which also contains Crombie's final word--not published elsewhere--and most of the relevant bibliography, including the Crombie review of Wallace in the *TLS* (22 November 1985) and the flurry of letters back and forth in the *TLS*.]

Week 5 (18 February): Galileo's Starry Messenger (1610)

Readings: Skim the intro to *Discoveries and Opinions* (1-19) and read "Starry Messenger" (1610), pp. 23-58; Westfall, "Scientific Patronage: Galileo and the Telescope," *Isis* 76 (1985) 11-30 [HSL]; Biagioli, "Galileo the Emblem-maker," *Isis* 81 (1990) 230-258 [HSL]; Shank, "Galileo's Day in Court," *Journal for the History of Astronomy* 25 (1994) 236-242; Drake, *Galileo at Work*, ch. 8-9, pp. 134-176 Darrel Rutkin, "Galileo Astrologer: Astrology and Mathematical Practice in the Late Sixteenth and Early- Seventeenth Centuries," *Galilaeiana* 2 (2005) 107-43 (go to <http://fermi.imss.fi.it/riviste/galilaiana/esearch.html>, type "rutkin" and see what happens. Explore the imss site.

Recommended: Mary Wickler and Albert Van Helden, "Representing the Heavens: Galileo and Visual Astronomy," *Isis* 83 (1992) 195-217.

Possible reports: Mario Biagioli, *Galileo, Courtier*, and the ensuing controversy: Shank, "Galileo's Day in Court," *Journal for the History of Astronomy* 25 (1994) 236-242; Biagioli, "Playing with the Evidence," and Shank, "How Shall We Practice History? The Case of Biagioli's *Galileo, Courtier*," *Early Science and Medicine* 1 (1996) 69-150; other reviews by Shapin, Golinski, Wallace, Shea, Pitt.

Week 6 (25 February): Galilean Controversies, 1610-1613

Readings: "Letters on Sunspots" (1613) in *Discoveries and Opinions*, pp. 89-144 (skim the intro, pp. 59-85); Castelli's 1613 letter to Galileo in Finocchiaro, *Galileo Affair*, pp. 47-48; "Letter to Castelli" (1613), in Blackwell, pp. 195-201 or Finocchiaro; Drake, *Galileo at Work*, ch. 10-12, pp. 177-230.

Possible reports: "Dispute over Bodies in Water," (See Drake, "Dispute over Bodies in Water," *Galileo Studies*, 159-176); Drake, *Cause, Experiment and Science*: only introduction and red print (=Galileo's "Bodies that Stay atop Water or Move in it") are required (the "dialogue" itself was composed not by Galileo, but by Drake!).

Week 7 (3 March): Natural Philosophy and Religious Knowledge

Readings: "Letter to Grand duchess Christina" in Finocchiaro, *Galileo Affair*, pp. 87-118 [**not in** *Discoveries and Opinions* (145-216)--Drake's translation is not as good]; Blackwell, ch. 2-3, pp. 53-110; Drake, *Galileo at Work*, ch. 13, pp. 231-251; Michel-Pierre Lerner, "The Heliocentric 'Heresy': From Suspicion to Condemnation," in Ernan McMullin, ed., *The Church and Galileo* (Notre Dame: U. of Notre Dame Press, 2005), pp. 11-37;

Recommended: Ernan McMullin, "Galileo on Science and Scripture," in *Companion*, 271-347.

Possible report: different approaches to the "Letter to the Grand duchess" (Santillana, Langford, Blackwell, Westfall, etc)

Week 8 (10 March): Galileo admonished

Readings: *Galileo on the World Systems*, pp. 38-43; Finocchiaro, *The Galileo Affair*, pp. 119-153 (incl. Discourse on tides); Blackwell, chap. 4-5, pp. 87-134, and Appendices 5-9A, pp. 203-273 (includes Foscarini's Letter); Galileo, "Letter to Archduke Leopold," (1618) and "Corrections of Copernicus" in Finocchiaro, *The Galileo Affair*, pp. 198-202; Drake, *Galileo at Work*, ch. 14, pp. 252-266; Annibale Fantoli, "The Disputed Injunction and its Role in Galileo's Trial," in Ernan McMullin, ed., *The Church and Galileo* (Notre Dame: U. of Notre Dame Press, 2005), pp. 117-49.

Possible reports: Bellarmine's Louvain Lectures, ed. U. Baldini and G. V. Coyne (Studi Galileani, vol. 1, #2, Vatican City, 1984); different approaches to the Admonition (Santillana vs. Drake in appendix to Geymonat; books by Redondi; Fantoli; Feldhay; etc)

Spring Break 15 March-23 March

Week 9 (24 March): Galileo the Philosopher?

Readings: Galileo, *The Assayer (Discoveries and Opinions)*, 217-281; Galileo, "Reply to Ingoli" (Finocchiaro, *The Galileo Affair*, 154-197); "Letter to Archduke Leopold," (1618) Corrections of Copernicus (Finocchiaro, *The Galileo Affair*, pp. 198-202); plus the anonymous complaint ("G3") and Guiducci's 1625 letter to Galileo, pp. 202-206; Drake, *Galileo at Work*, ch. 15 and beginning of 16, pp. 267-297.

Possible report: The Redondi thesis (*Galileo, Heretic*, including reviews) and Westfall's response (in his *Essays on the Trial of Galileo*).

Week 10 (31 March): Galileo's *Dialogue* (1632) I

Readings: *Galileo on World Systems*, "To the Discerning Reader," and Day One, pp. 77-116 including the explanatory notes; Drake, *Galileo at Work*, ch. 16-17, pp. 289-329.

Possible report: Methodological and philosophical takes on Galileo: the Platonist (Koyré, "Galileo and Plato" from his *Metaphysics and Measurement*), or the anarchist (Paul Feyerabend's *Against Method* with responses by Peter Machamer and Alan Chalmers), or the empiricist (S. Drake), or the smart Aristotelian (William Wallace); etc.

Week 11 (7 April): Galileo's *Dialogue* (1632) II

Readings: *Galileo on World Systems*, Day Two, pp. 117-220 including the explanatory notes; Drake, *Galileo at Work*, ch. 18, pp. 330-352.

Week 12 (14 April): Galileo's *Dialogue* (1632) III

Readings: *Galileo on World Systems*, Days Three and Four, pp. 221-308 including the explanatory notes; Drake, *Galileo at Work*, ch. 19, pp. 353-372.

Week 13 (21 April): Galileo in Trouble

Readings: Trial documents in Finocchiaro, ed., *The Galileo Affair*, pp. 198-255; Artigas, Martinez and Shea, "New Light on the Galileo Affair," in Ernan McMullin, *The Church and Galileo*, pp. 213-33.

Possible report: Historiography of the trial –many sources and interpretations (much literature reviewed in Fantoli)

Week 14 (28 April): Galileo and the Roman Inquisition

Readings: Finocchiaro, ed., *The Galileo Affair*, pp. 256-293; Blackwell, *Galileo, Bellarmine*, ch. 6-7, pp. 135-179; D. P. Walker, *Spiritual and Demonic Magic from Ficino to Campanella* (Notre Dame, 1958. 1969), pp. 203-212; Shank, "Setting the Stage," conclusion. pp. 69-81;

Week 15 (5 May): Galileo's mature mechanics

I. B. Cohen, "Toward an Inertial Physics;" Galileo Galilei, *Two New Sciences* (Drake transl.), Day 3 (pp. 153-170) and Day 4 (217-229); Drake, *Galileo at Work*, ch. 20-22, pp. 373-436; Ken'ichi Takahashi, "A Historical Reconstruction of Galileo's Theory of Motion: 1604-1630: An Escape from his Conceptual Labyrinth," unpublished manuscript; Dibner and Drake, eds., *A Letter from Galileo Galilei* (Norwalk, Conn.: Burndy Library, 1967), browse intro; read letter.

See also: Ken'ichi Takahashi, "Galileo's Labyrinth: His Struggle for Finding a Way out of his Erroneous Law of Natural Fall," *Historia Scientiarum* 2(1993) 169-202; 3(1992) 1-34.

Among the many suitable for reports and reviews:

Galileo, *De motu* (HSL)

Geymonat, *Galileo Galilei* (HSL)

William Wallace, *Galileo's Early Notebooks* (Notre Dame) (HSL)

William Wallace, *Galileo and His Sources* (Princeton)

William Shea, *Galileo's Intellectual Revolution*

Joseph Pitt, *Galileo, Human Knowledge, and the Book of Nature* (philosophy of science orientation)

Paul Feyerabend, *Against Method* (iconoclastic philosophy of science orientation)

Michael Segrè, *In the Wake of Galileo* (Italy after Galileo)

Giorgio de Santillana, *The Crime of Galileo* (a classic, anticlerical approach)

C. B. Schmitt, Variorum Reprint of his Galilean materials (Pisa etc)

Ludovico Geymonat, *Galileo Galilei* (HSL)—philosophical biography

James Reston, Jr., *Galileo* (HarperCollins, 1994)—for the general reader

Michael Sharatt, *Galileo, Decisive Innovator* (Cambridge UP)—scholarly biography

Jean Dietz Moss, *Novelties in the Heavens* (rhetorical analysis)

Annibale Fantoli, *Galileo for Copernicanism and the Church* (comprehensive); several editions

Rivka Feldhay, *Galileo and the Church: Political Inquisition or Critical Dialogue?* (Jesuits vs. Dominicans)

Biagioli, *Galileo Courtier* (Chicago, 1993)

Biagioli's new book

Redondi, *Galileo Heretic* (Princeton, 198)

Westfall on Redondi

William Shea and Mariano Artigas, *Galileo in Rome* (Oxford)

Finocchiaro, *Retrying Galileo, 1633-1992*

Richard Blackwell, *Behind the Scenes in Galileo's Trial*

In Italian:

Michele Camerota's new biography—large and detailed

Favaro on Galileo and Padua;

L. Olschki biography of Galileo

On Galileo's first brush with the Inquisition

Possible reports:

HSL=History of Science Dept Library

Background

James Lattis, *Between Copernicus and Galileo: Christoph Clavius and the Collapse of Ptolemaic Cosmology* (Chicago: University of Chicago Press, 1994)

Vincenzio Galilei as a theoretician of music (Palisca, primary sources)

The Early Galileo

Galileo, *De motu* (HSL)

William Wallace, *Galileo's Early Notebooks* (Notre Dame) (HSL)

William Wallace, *Galileo and His Sources* (Princeton)

more Wallace

Mechanics

Alexandre Koyré, *Galilean Studies*

William Shea, *Galileo's Intellectual Revolution*

Joseph Pitt, *Galileo, Human Knowledge, and the Book of Nature*

Paul Feyerabend, *Against Method*

Peter Machamer,

C. B. Schmitt, Variorum Reprint of his Galilean materials (Pisa etc)

The Years after the Telescope

Mario Biagioli, *Galileo, Courtier*

Jean Dietz Moss, *Novelties in the Heavens*

Galileo and the Church

Giorgio de Santillana, *The Crime of Galileo* (HSL)

Annibale Fantoli, *Galileo for Copernicanism and the Church*

Rivka Feldhay, *Galileo and the Church: Political Inquisition or Critical Dialogue?*

Aftermath

Michael Segrè, *In the Wake of Galileo*

In Italian:

Favaro on Galileo e lo Studio di Padova; L. Olschki biography of Galileo