

Fall 2012
Prof. Pamela Gossin
Email: psgossin@utdallas.edu

Office: JO3.927
Office Hrs: T 6:00-6:45pm in JO
F. 9:30-9:50am in CR
+ other days/times by appt – just ask!

HIST 3328.002
History and Philosophy of Science: Perspectives for UTeach
(aka History of Science from Greeks to Geeks)
F. 10am - 12:45 pm Room: CR 1.202 (Callier Center)

Pre-requisites:

HIST 1301, HIST 1302, HIST 2301, HIST 2330, HIST 2331, or equivalent; and enrollment in UTeach program. This course is especially designed for those training to be elementary and secondary science and mathematics teachers through the UTeach program, and (space permitting) other students interested in the interdisciplinary relations of science and the humanities, such as pre-health majors, and those pursuing the minor in Medical and Scientific Humanities. ***HIST 3328 counts toward the Minor in Medical and Scientific Humanities (MaSH)***

Course Description:

Where did science come from? How did human beings begin to make sense of the natural world and their part in it? How are the same processes of imagination, invention and discovery still at work today in shaping human cultures' understanding of natural phenomena? What roles did those from various knowledge bases and "disciplinary" backgrounds play in the evolution of science?

In this interdisciplinary history course we will ask those questions (and more!) as we read and discuss texts of natural philosophy, the history of science, scientific biography and literature. We will trace the origins and development of western science and its construction of natural knowledge from the ancient world through the near present. From philosophical, scientific and literary points of view, we will explore whether there was any such thing as the "Scientific Revolution," and if so, how the "revolutionary" changes in world views influenced human life on social, political and personal levels. How do scientific ideas and technological developments continue to transform our minds, bodies and lives today?

The central inquiries of this class will focus on these questions: What is "nature"? What is "natural"? What is "supernatural"? How have our definitions of such concepts changed over time and altered our ideas about what it means to be "human"? Do we "discover" order in the universe or do we "invent" it? How have the relationships between (and relative values and roles of) imagination, faith and reason shifted from the ancient world through the early modern period into the present? With what consequences?

Class meetings will include lecture, discussion, films and student presentations as we examine developments in magic and alchemy, astronomy and cosmology, natural history, the history of medicine, life sciences, and experimental science. NO technical or specific scientific background is required.

NOTE: All student papers and presentations will be expected to connect the historical and literary "perspectives" presented in class to modern (18thc to contemporary) developments in science. All students will write a 2pp film critique and a 3 pp interpretative/analytical paper over a relevant scientific auto/biography, work of "literary science" or a text about inventions, technology, mathematics or the history of science (see lists on next page). The 3pp book paper will be graded as the take-home essay portion of the final exam. In addition, UTeach students will create lesson plans and in-class presentations ("mini-lessons") that draw upon the historical and cultural information found in their selected text and paper.

Course objectives:

Students will read and discuss a wide variety of literary and historical texts, demonstrating the ability to interpret and analyze themes and issues using various critical methods, including formal, historical, biographical and cultural approaches. Students will write a film critique, an analytical/interpretative paper, and lesson plan and make in-class presentations.

REQUIRED TEXTS (all students will need all listed)

Marlowe, Christopher, *Dr Faustus*

Baigrie, Brian, *Scientific Revolutions: Primary Texts in the History of Science* (selections; SR for short)

Appleman, Philip, ed., *Darwin* (selections)

Feynman, Richard, *Surely You're Joking Mr. Feynman*

Watson, James, *The Double Helix*

Crowe, Michael, *Theories of the Worlds: From Antiquity to the Copernican Revolution* (selections)

Lindberg, David C. *The Beginnings of Western Science* (2nd ed or newer)

Gleick, James, *Isaac Newton*

Holmes, Richard, *The Age of Wonder* (selections)

REQUIRED TEXTS (ELECTRONIC RESERVE and 2 HR RESERVE)

Hankins, Thomas, *Science and the Enlightenment*, selections (may also be purchased at Half-Price Books)

Women in Science, selected articles (on electronic reserve)

Galileo's Battle for the Heavens, video/dvd

ADDITIONAL REQUIRED TEXT (just purchase/check out ONE)

(This is for use as the subject of a 3pp take-home essay and the UTeach lesson plan and in-class presentation.

All students must select something from one of the 3 categories/columns below, but you may also substitute another title, with Prof's prior approval. Just tell me about it and let me think it over!)

BIOGRAPHY/AUTOBIOG'Y	"LITERARY" SCIENCE	INVENT/TECH/MATH/HISTORY
Sobel, <i>Galileo's Daughter</i>	- Poems: Butler, Thomson et al#	Jardine, <i>Ingenious Pursuits</i>
* Heiligman, <i>Charles and Emma</i>	- Swift, <i>Gulliver's Travels</i>	Macdonald, <i>Feminine Ingenuity</i>
Brock, <i>Comet Sweeper</i>	- Fontenelle, <i>Conversations</i>	Weitekamp, <i>Right Stuff, Wrong Sex</i>
Goodall, <i>Reason for Hope</i>	- Galileo, <i>Sidereus Nuncius</i>	Sobel, <i>Longitude</i>
McGrayne, <i>Nobel Prize Women</i>	- Wilson, <i>Anthill: A Novel</i>	* Turkle, ed. <i>Falling for Science</i>
* Maddox, <i>Rosalind Franklin</i>	- Overbye, <i>Einstein in Love</i>	Seife, <i>Zero or Proofiness</i>
Gornick, <i>Women in Science</i>	- Eiseley, <i>Immense Journey</i>	Clark, <i>Sun Kings</i>
* Sobel, <i>A More Perfect Heaven</i>		* Lehrer, <i>Imagine: How Creativity Works</i>
* Des Jardins, <i>The Madame Curie Complex</i>		Numbers, <i>Galileo Goes to Jail and other myths about Sci. and Religion</i>

* indicates ordered by campus/off-campus bookstores. Other titles should be in library or area bookstores also.

ask Prof G for free xerox handouts !

Grading/ Course Requirements: UTeach Students will complete items 1-4, with each counting 25%; non-UTeach students (if any) will complete items 1-3, with each counting 1/3rd of their total course grade.

1. Attendance and participation (A&P): includes in-class participation, 2 pp film critique, quizzes, study sheets, peer review comments
2. Midterm unit exam: 30pt in-class essay + 70 pt objective section
3. Final unit exam: 3 pp book critique as (30pt) take-home essay + 70 pt. objective section
4. UTeach students: 10 min presentation and lesson plan (due same day as presentation and will be averaged together to equal 25%)

* Other extra credit assignments may be used to enhance your A&P grade, such as Reading Notebooks and vocabulary definitions, taking notes on "Special Topics" readings etc. Listen in class for more ideas and info!

COURSE CALENDAR/ DAILY ASSIGNMENTS

This course has been organized into two central units, with one exam for each unit (midterm/final):

1: Ancient and Medieval World Views: Foundations of “Revolution”?

2: “Mechanical” World View: Experiment, Extrapolation, Imagination.

Most class periods will be divided into two halves (before and after a 10-15 min. break).

**** HINT:** You should have all readings listed under a particular class day, read FOR that class day. ******

“*Background reading*” is intended to provide you with supplementary perspectives and contexts that will enrich your understanding of information mentioned in lecture and other required texts. We will sometimes have time to discuss background reading, although probably not often. You are always welcome to ask questions about the background reading as part of our lecture discussions. It is test-able information, so you should take notes on it and study and review it as you prepare your papers, lesson plans, presentations, quizzes and exams.

IMPORTANT TIP: use a 70pp spiral notebook to take and keep your reading notes in. You may also use it to keep track of unfamiliar vocabulary words from lectures and reading, along with their definitions. At the end of the course, you may turn these notebooks in along with your FINAL EXAM for up to 100 EXTRA CREDIT POINTS!

UNIT ONE: Ancient and Medieval World Views: Foundations of “Revolution”?

wk 1: F. Aug. 31

A) 1h.15m: Take roll. Go over syllabus. Intro. to Course: Structure, Expectations, Definitions.

What is Science? What is the History of Science?

Break (usually 10 min)

B) 1h.15m: Lecture: Origins of Human Knowledge of Nature in Prehistory

Background Reading:

Lindberg, pp.1-20: Science before the Greeks

Crowe, pp.197-219: Archaeoastronomy, Stonehenge

* [Course management hint: Start reading and keeping notes on assigned reading materials. List unfamiliar vocabulary terms and write down their definitions. Start browsing through books to use as the basis for your 3pp final essay and presentation/lesson plan.]

wk 2: F. Sep. 7:

A) 15m: Discuss expectations and tips for Papers / Lesson Plans / Presentations

60m: Begin Lecture: Early History: Natural Philosophy and Cosmology in the Ancient Greek World

Break

B) 1h.15m: Finish Lecture: Ancient Greece: Aristotle and Plato

Background Reading:

Lindberg, pp.21-44: *The Greeks and the Cosmos*; pp.45-66: *Aristotle's Philosophy of Nature*; pp.67-81: *Hellenistic Natural Philosophy* (Plato and others)

Crowe, pp. 1-29 and pp. 42-65: Chp 1: *Celestial Motions*; Chp 2: *Greek Ast'y before Ptolemy* and Chp 4: *The Ptolemaic System*

Special Topics Reading (For Extra Credit and of particular interest to Math Ed. Students!):

Lindberg, pp.82-110: Chp 5: *Mathematical Science in Antiquity*

Crowe, Chp 3: *Math'l Techniques of Ancient Astronomy*

wk 3: F. Sep. 14:

A) 1h.15m: Science in the Middle Ages: Magical and Animistic World Views

Break

B) 1h.15m: Discuss reading: Marlowe, *Dr. Faustus* (whole book)

Discussion Reading: Marlowe, *Dr. Faustus* (whole book)

Background Reading: Baigrie, *Scientific Revolutions (SR)*, pp. 1-15 (Aristotle, Ptolemy, Lucretius) and pp. 62-70 (Francis Bacon)

Special Topics Reading (For Extra Credit):

Lindberg, Chp 8, pp. 163-192: *Islamic Science*; Chp 9, pp. 193-224: *Revival of Learning in the West*; Chp 10, pp.225-253: *Recovery and Assimilation of Greek and Islamic Science*

wk 4: F. Sep 21:

A) 1h.30m: Lecture: Biology and Medicine: From Galen to Vesalius and Harvey

Break

B) 1h: STUDENT PRESENTATIONS

1. _____ / 2. _____

3. _____

Background Reading:

Lindberg, Chp 6, pp.111-131: *Greek and Roman Medicine*; Chp 13, pp. 321-356: *Medieval Medicine and Natural History*

Baigrie, *SR*, pp. 40-55 (Vesalius, Paracelsus); pp. 71-87 (Harvey); pp. 108-114 (Hooke)

wk 5: F. Sep 28: *** REMINDER: **2 pp FILM CRITIQUE WILL BE DUE NEXT WEEK (OCT 5)** ***

A) 2 hrs: VIDEO: "Galileo's Battle for the Heavens"

(Use the viewer guide sheet to take notes for your 2pp film critique)

Background Reading (will help with this week and in preparation for next couple weeks):

Lindberg, Chp 11 pp. 254-285: *Medieval Cosmos*; Chp 14, pp.357-367: *Legacy of Ancient and Medieval Science*; Baigrie, *SR* pp. 16-39 (Copernicus); Crowe, pp. 82-135: The Cop'n system

wk 6: F. Oct. 5: **2 pp FILM CRITIQUES DUE AT BEGINNING OF CLASS!**

A) 1h. Lecture, pt. 1: Was there a Scientific Revolution? The Case for Copernicus

Short Break

B) 1h. Lecture, pt 2: The "New" Astronomy and Physics: Contributions of Tycho, Galileo, Kepler and Gilbert

35 min: STUDENT PRESENTATIONS

4. _____

5. _____ / 6. _____

Background Reading: Baigrie, *SR* pp 56-61 (Tycho) and pp. 88-98 (Galileo)

Crowe, pp. 136-145, Chp 7: The Tychonic System; pp. 146-155, Chp 8: Kepler; and pp. 156-172, Chp 9: Galileo

Special Topics Reading for Extra Credit (of extra interest to math/physics students):

Lindberg, Chp 12 pp. 286-320: *Physics of the Sublunary Region*

wk 7: F. Oct 12:

A) 1.30m: Lecture: The Newtonian Achievement: Descartes to Newton and Discuss Gleick's book
Break

B) 45m: STUDENT PRESENTATIONS

7. _____ / 8. _____

9. _____

15m: Go over exam study hints, exam structure.

Discussion Reading: Gleick, *Isaac Newton* (whole book)

Background Reading: Baigrie, *SR* pp. 99-107 (Descartes); pp. 133-150 (Newton);

Special Topics Reading, for Extra Credit and of interest to Math Ed: Hankins, Chp 2, pp.17-45 (2 hour reserve)

wk 8: F. Oct 19: * * * 2h.30m MIDTERM, with 30pt. in-class essay and 70 pt. objective sections * * *

UNIT 2: “Mechanical” World View: Experiment, Extrapolation, Imagination.

wk 9: F. Oct 26:

A) 1h.45m: Lecture: Post-Newtonian Astronomy and Cosmology: The Herschels; and Discuss selections from Holmes book.

Break

B) 45 min: STUDENT PRESENTATIONS

10. _____ / 11. _____

12. _____

Discussion reading: Holmes, Chps 2 and 4: 60-124, 163-210 (the Herschels and astronomy)

Background Reading: Baigrie, SR pp.175-188 (Herschel and Mitchell);
Hankins, Chp 1: pp.1-16 (Enlightenment, *on 2 hour reserve*)

wk 10: F. Nov. 2: HALLOWEEN COSTUME PARTY for EXTRA CREDIT!

A) 30m: Guess Costumes!

1 hr: Lecture: The Experience of Experiment in the Biological and Physical Sciences

Break

B) 45 min: STUDENT PRESENTATIONS

13. _____ / 14. _____

15. _____

Background Reading: Baigrie, SR, 115-132, 157-174, 195-208;
Hankins, Chp. 3: pp.46-80 (*on 2 hour reserve*)

**** REMINDER: 3 pp Book Essay Due in 2 weeks.**

wk 11: F. Nov. 9:

A) 1hr. Lecture: Natural History before Darwin; 30-45min: Discuss Origin and Descent (using study sheets)

Break

B) 45 min. STUDENT PRESENTATIONS

16. _____ / 17. _____

18. _____

Discussion Reading: Darwin: *Origin and Descent*: pp. 3-20; 87-94, 95-135; 175-213; 243-254.

Background Reading: Baigrie, SR 151-156 (Linnaeus); 209-225 (Hutton), 239-246 (Cuvier)
Hankins, Chp 5: pp. 113-157 (*on electronic reserve*)

Special Topics Reading for Extra Credit: Baigrie, 251-165 (Lyell), 285-322 (Darwin)

wk 11: F. Nov 16: **3pp BOOK ESSAY DUE AT BEGINNING OF CLASS (Counts as 30pt essay on Final)**

A) 2h: View film, *The Race for DNA*

Brief break

B) 30m: Student-group led discussion of book and film – to be videotaped.

3-4 DISCUSSION LEADERS: _____, _____, _____, _____

(Everyone hand-in completed viewer response sheet)

Discussion Reading: Watson, *The Double Helix* (whole book)

F. Nov. 23: HAPPY THANKSGIVING: NO CLASS THIS WEEK

wk 12: F. Nov. 30: *Women in Science*

A) 1hr: View and Discuss: *Discovering Women: High Energy Physics* (Melissa Franklin)

(Brief break only!)

B) 1hr: View and Discuss: *Discovering Women: Jewels in a Test-tube* (Lynda Jordan)

30m: Student-group led discussion of videos and reserve readings

3-4 DISCUSSION LEADERS: _____, _____, _____, _____

Discussion Reading: [Women in Science articles, *on electronic reserve*]

Wk 13: F. Dec 7: *Having Fun with Science!*

A) 30m: Student-group led discussion of Feynman book

3-4 BOOK DISCUSSION LEADERS: _____, _____, _____, _____

60m: view Nova “The Pleasure of Finding Things Out”

Break

B) 30m: 3-4 VIDEO DISCUSSION LEADERS: _____, _____, _____, _____

Student-group led discussion of Feynman video

15m: Discuss structure of Final exam

Discussion Reading: Feynman, “*Surely, You’re Joking, Mr. Feynman!*” (whole book)

*** F. DEC 14th, FINAL @ regular class time: **2 hour EXAM**, 70 pt. objective section only ***

{Note this date/time is subject to change – we’ll need to check final exam schedule with Registrar closer to time}

Instructor's Policies and Class Philosophy

Please inform the professor *in advance* (via utd email) of any possible absences or situations that may keep you from submitting assignments on time. I'll try to help in any way I can. Late assignments will not be accepted nor absences excused *without such prior notice*. Because attendance and participation count as a substantial part of your grade in this course, unexcused absences, tardy arrivals, early departures will count against this portion of your grade.

In accordance with university policy (and my personal and professional values), this is a drug-free, alcohol-free, smoke-free, barrier-free classroom. In the interests of promoting a comfortable learning environment, all students and the professor pledge to respectfully consider the expression of ideas and opinions by others regardless of political, philosophical, religious, intellectual, cultural, racial, generational or gender differences.

Any student found guilty of plagiarism (using another person's thoughts, words, ideas, terminology etc. without properly acknowledging them with footnotes, endnotes, or parenthetically in the text with a bibliography will be subject to disciplinary action under the policies of the University of Texas-Dallas. See the university's student code, MLA style sheet or Chicago Manual of Style for more information.

All syllabus info., descriptions and timelines are subject to change at the discretion of the Professor.

Students are responsible for listening for in-class announcements/changes and checking their UT-Dallas email accounts for additional messages (which may supercede info. on this syllabus).

FOR ADDITIONAL APPLICABLE UTD POLICY STATEMENTS SEE:

<http://go.utdallas.edu/syllabus-policies>

* * *

MORE RECOMMENDED TEXTS (Tip of the Iceberg!)for PAPERS and PRESENTATIONS FOR HIST 3328

History of Ancient and Medieval Science and Medicine

1. Lindberg, David *The Beginnings of Western Science* (other relevant chapters)
2. Hamburger, Jean. *Diary of William Harvey* (fictionalized diary) Rutgers University Press; (October 1992)
ASIN: 0813518253
3. Porter, Roy, *The Greatest Benefit to Mankind: A Medical History of Humanity* (relevant chapters)
4. Miller, Andrew. *Ingenious Pain* (novel)
5. Ulrich, Laurel, *A Midwife's Tale*. Vintage; Reprint edition (June 4, 1991) **ISBN:** 0679733760
6. Lewis, C.S. *The Discarded Image*

Sci Rev / Copernicus

1. Banville, John, *Doctor Copernicus* (biographical novel)
2. Dear, Peter, *Revolutionizing the Sciences : European Knowledge and Its Ambitions, 1500-1700*.
Princeton Univ Pr; (April 1, 2001) **ISBN:** 0691088608
3. Henry, John, *The Scientific Revolution and the Origins of Modern Science* (Studies in European History),
Palgrave Macmillan; 2nd edition (January 2002) **ISBN:** 0333960904
4. Westfall, Richard. *The Construction of Modern Science*
5. Ferris, Timothy, *Coming of Age in the Milky Way*
6. Biagioli, Galileo, *Courtier*
7. Moss, J.D. *Novelties in the Heavens: Rhetoric of Science and the Copernican Controversy*
8. Hallyn, Fernand, *Poetic Structure of the World*

Tycho, Kepler

1. Ferguson, Kitty, *Tycho and Kepler*, Walker & Co; (November 2002) **ISBN:** 0802713904
2. Banville, John, *Kepler* (biographical novel)
3. Voelkel, James, *Johannes Kepler and the New Astronomy*

Sci and Religion

1. William Shea, *Galileo in Rome: the Rise and Fall of a Troublesome Genius*, Oxford University Press;
(September 2003) **ISBN:** 019516598
2. James A. Connor, *Kepler's Witch : An Astronomer's Discovery of Cosmic Order Amid Religious War,
Political Intrigue, and the Heresy Trial of His Mother*; Harper San Francisco; (March 30, 2004) **ISBN:**
0060522550
3. Lindberg, David. *God and Nature* (relevant chapters)
4. Westfall, Richard, *Science and Religion in the 17th C.*
5. Brookes, John. *Science and Religion*

Newton

1. Westfall, Richard, *Never at Rest: A Biography of Isaac Newton*; Cambridge University Press; (April 1983) **ISBN: 0521274354**
2. Westfall, Richard, *Newton. The Life of Isaac Newton: Abridged*. Cambridge University Press; Reprint edition (July 29, 1994) **ISBN: 0521477379**
3. Dobbs, Betty Jo Teeter, *Newton and the Culture of Newtonianism*. Humanity Books; (February 1995) **ASIN: 1573925470**

Women and Science

1. Merchant, Carolyn, *The Death of Nature: Women, Ecology and the Scientific Revolution*. Harper San Francisco; Reprint edition (January 10, 1990) **ISBN: 0062505955**
2. Schiebinger, Londa, *The Mind Has No Sex?* Harvard Univ Pr; Reprint edition (March 1991) **ISBN: 067457625X**
3. Shteir, Ann and Gates, Barbara. *Natural Eloquence: Women Reinscribe Science*; University of Wisconsin Press; (June 1997) **ISBN: 029915484X**
4. Whitaker, Katie, *Mad Madge: The Extraordinary Life of Margaret, Duchess of Newcastle, the First Woman to Live by Her Pen*, Basic Books; (September 2002) **ISBN: 046509161X**
5. Todd, Janet. *The Secret Life of Aphra Behn*, Rutgers University Press; (September 1997) **ISBN: 0813524555**
6. Fox Keller, Evelyn. *A Feeling for the Organism: Life and Work of Barbara McClintock*
7. Pycior, et al, *Creative Couples in the Sciences*
8. Abir-am and Outram, *Uneasy Careers and Intimate Lives*

Experimental Science

1. Shapin and Schaffer, *Leviathan and the Air Pump*, Princeton Univ Pr; Reprint edition (October 1989) **ISBN: 0691024324**
2. Heilbron, J.L. *Electricity in the 17th and 18th Century: A Study of Early Modern Physics*, University of California Press; (June 1979) **ASIN: 0520034783**
3. Latour, Bruno. *Laboratory Life*, Princeton Univ Pr; Reprint edition (September 1, 1986) **ISBN: 069102832X**

Literature of Science

1. Behn, Aphra, *Emperor of the Moon* (play, comedy/satire)
2. Shadwell, *The Virtuoso* (play, comedy/satire)
3. Jonson, Ben. *The Alchemist* (play, comedy/satire)
4. Cavendish, Margaret, *New Blazing World* (prose medley, imaginary voyage)
5. Pope, Alexander *Essay on Man* and the *Dunciad* (poetic essay/ mock heroic poem)
6. Milton, *Paradise Lost* (classic Christian epic poem)
7. Nicolson, Marjorie, *Science and Imagination*
8. Eco, Umberto. *Island of the Day Before* (experimental novel, late 20th c)
9. Stephenson, Neil. *Quicksilver* (experimental novel, early 21st c)

Lit of Sci Crit

- Shortland, Michael and Richard Yeo, eds. *Telling Lives in Science: Essays on Scientific Biography*
ISBN-10: 0521433231; ISBN-13: 978-0521433235
- Soderqvist, Thomas. *The History and Poetics of Scientific Biography* (Science, Technology and Culture, 1700-1945) **ISBN:10: 0754651819; ISBN-13: 978-0754651819**