Fall 2010
Prof. Pamela Gossin
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Office: Temporary: JO5.304
Office Hrs: R. 4-5pm; F.1-1:30pm + appt

HIST 3328.001
History and Philosophy of Science: Perspectives
F 10:00-12:45 pm Room: SOM 2.103

Pre-requisites:
HIST 1301, HIST 1302, HIST 2301, HIST 2330, HIST 2331, or equivalent. Pre-requisite may be waived for UTeach students with permission of instructor. This course is especially designed for those training to be elementary and secondary science and mathematics teachers including UTeach students and others interested in the interdisciplinary relations of science and the humanities, such as pre-health majors, and others pursuing the minor in Medical and Scientific Humanities (MaSH).

* * * *This course 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 SCIENTIFIC BACKGROUND IS REQUIRED. Student research projects and presentations will focus on connecting the historical and literary "perspectives" on the Sci. Rev. presented in class to modern (18thc to contemporary) developments in science, through a relevant scientific biography or autobiography, work of "literary science" or text about inventions, technology or mathematics (students' choice). UTeach program participants will create lesson plans and a matching in-class presentation ("mini-lesson") that incorporate relevant supplementary materials. Other students will write a 5 pp analytic and interpretative paper, with the option of also doing a presentation for extra credit.

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 research and write an analytical and interpretative paper or will research and present a lesson plan and class lesson, using primary and secondary sources.

REQUIRED TEXTS -- literature and science:
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*

REQUIRED TEXTS – history and philosophy of science:
Crowe, Michael, *Theories of the Worlds: From Antiquity to the Copernican Revolution* (selections)
Dear, Peter, *The Intelligibility of Nature: How Science Makes Sense of the World*
Gleick, James, *Isaac Newton*
Holmes, Richard, *The Age of Wonder* (selections)
Shapin, Steven, *The Scientific Revolution*

2 HOUR or ELECTRONIC RESERVE
Hankins, Thomas, *Science and the Enlightenment* (2 hour reserve; may also be purchased at Half-Price Books)
Women in Science, selected articles (on electronic reserve)

ADDITIONAL REQUIRED TEXT (STUDENT'S CHOICE, with prof. approval; available at UTD bookstore, library, Off-Campus, Half-Price, Amazon etc)
Students must select one additional text or set of texts from one of these 3 categories: Biography /Autobiography, "Literary" Science or Inventions/Tech/Math The selected text will serve as the basis for a 5 pp paper (non-UTeach students) and/or an in-class presentation/lesson plan (UTeach students)

BIOGRAPHY/AUTOBIOG'Y	"LITERARY" SCIENCE	INVENTIONS/TECH/MATH
Sobel, *Galileo's Daughter*	- Poems:Crowe+Butler, Thomson*	Jardine, *Ingenious Pursuits*
Heiligman, *Charles and Emma*	- Swift, *Gulliver's Travels*	Macdonald, *Feminine Ingenuity*
Brock, *Comet Sweeper*	- Fontenelle, *Conversations*	Weitekamp, *Right Stuff, Wrong Sex*
Goodall, *Reason for Hope*	- Galileo, *Sidereus Nuncius*	Sobel, *Longitude*
McGrayne, *Nobel Prize Women*	- Wilson, *Anthill: A Novel*	Turkle, ed. *Falling for Science*
Maddox, *Rosalind Franklin*	- Overbye, *Einstein in Love*	Seife, *Zero*
Gornick, *Women in Science*	- Eiseley, *Immense Journey*	Clark, *Sun Kings*
+ students' choice**	+ students' choice**	+ students' choice**

* No purchase necessary, ask Prof G for handouts ; ** For texts not on this list, please get prior approval :-)

HIGHLY RECOMMENDED REFERENCE RESOURCES:
Kuhn, *The Structure of Scientific Revolutions* – (50 pts. Extra Credit, w/ 3pp paper)
ISIS Cumulative Bibliography for the History of Science
MLA Bibliography and *MLA Style Guide*

Grading/ Course Requirements

- Attendance and participation (A&P)*, including any quizzes, study sheets etc = 25%
- Midterm (1st unit exam, in-class essay and objective portion) = 25%
- 2nd unit exam (objective only) = 25 %
- One 5 pp written analytical and interpretative essay (non-UTeach students) OR one grade-level appropriate lesson plan and 10 min. in-class presentation (UTeach students): averaged to = 25% of grade

* Optional extra credit may be used to enhance A&P grade. Listen for more info on these in class.

COURSE CALENDAR/ DAILY ASSIGNMENTS

This course has been organized into two central units, 1: Ancient and Medieval World Views: Foundations of "Revolution"? and 2: "Mechanical" World View: Experiment, Extrapolation, Imagination." Most class periods will be divided into two halves (before and after a 10-15 min. break). You should have all readings listed under a particular class day, read FOR that class day.

UNIT ONE: **Ancient and Medieval World Views: Foundations of "Revolution"?**

wk 1: F. Aug 20

A) 1.15m: Go over syllabus. Take roll. Intro. to Course: Structure, Expectations, Definitions.
What is Science? What is the History of Science?
Short break
B) 1.15m: Lecture: Origins of Human Knowledge of Nature in Prehistory

Background Reading: Crowe, pp.197-219: Archaeoastronomy, Stonehenge

* [Course management hint: Start reading and keeping notes on assigned reading materials listed below. Also, start browsing for materials to use as the basis for your paper or presentation/lesson plan.]

wk 2: F. Aug 27:

A) 30m: Discuss research resources for papers and presentations
45m: Begin Lecture: Early History: Natural Philosophy and Cosmology in the Ancient Greek World
Break
B) 1.15m: Finish Lecture: Ancient Greece

Background Reading: 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
Optional Reading (of special interest to Math Ed): Chp 3: Math'l Techniques of Ancient Astronomy

wk 3: F. Sept 3:

A) 1.15m: Science in the Middle Ages: Magical and Animistic World Views
Break
B) 1.15m: 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)

wk 4: F. Sept 10:
A) 1.15m: Lecture: Biology and Medicine: From Galen to Vesalius and Harvey
Break
B) 1hr:: STUDENT PRESENTATIONS (peer critiques required)

1. _____ / 2. _____

3. _____

15m: Q&A / Catch-up

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

wk 5: F. Sept 17:
A) 1.15m: Lecture: Was there a Scientific Revolution? The Case for Copernicus
Break
B) 1hr: STUDENT PRESENTATIONS

4. _____ / 5. _____

6. _____

15m: Q&A / Catch-up

Background Reading: Baigrie, *SR* pp. 16-39 (Copernicus);
Crowe, pp. 82-135: The Cop'n system;
Shapin, pp 1-64, Intro and Chp 1: What was Known?.

wk 6: F. Sept 24:

A) 15m: Quick Quiz?
1hr: Begin Lecture: The "New"Astronomy and Physics of Tycho, Galileo, Kepler and Gilbert
Break
B) 30m: Finish Lecture
45m: STUDENT PRESENTATIONS

7. _____ / 8. _____

9. _____

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

wk 7: F. Oct 1:
A) 2 hr: View film: "Galileo's Battle for the Heavens" (NOVA, 120m)
(No Formal Break Today)
B) 30m: Discuss film; go over Exam format, study hints

wk 8: W. Oct 8: * * * 2 Hour MIDTERM, with in-class essay and objective sections * * *

UNIT 2: "Mechanical" World View: Experiment, Extrapolation, Imagination.

wk 9: F. Oct 15:
* Hand-out Darwin Study Sheets for Oct 29 *

A) 1.15m: Lecture: The Newtonian Achievement: Descartes to Newton
Break
B) 1.15m: STUDENT PRESENTATIONS (on Gleick's *Isaac Newton* and related subjects)

10. _____ / 11. _____

12. _____ / 13. _____

14. _____

Background Reading: Baigrie, *SR* pp. 99-107 (Descartes); pp. 133-150 (Newton);
Dear, pp. 1-38: Intro and Chp 1: The Mechanical Universe
Gleick, *Isaac Newton* (whole book)
Optional Reading, for Extra Credit: Kuhn, *Structure of Sci Rev*, Chps I - VI, pp. 1-91
Hankins, Chp 2, pp.17-45 (for Math Ed, *on 2 hour reserve*)

wk 10: F. Oct 22:

A) 1.15m: Lecture: Post-Newtonian Astronomy and Cosmology.
B) 1 hr: STUDENT PRESENTATIONS (on late 18th thru 19th-c topics)

15. _____ / 16. _____

17. _____ / 18. _____

Background Reading: Baigrie, *SR* pp.175-188 (Herschel and Mitchell);
Hankins, Chp 1: pp.1-16 (Enlightenment, *on 2 hour reserve*)
Holmes, Chps 2 and 4: 60-124, 163-210 (the Herschels and astronomy)
Optional Reading, for Extra Credit: Kuhn, *Structure of SR*, Chps VII-Postscript, pp. 92-210.

wk 11: F. Oct 29: * *EXTRA CREDIT HISTORY OF SCIENCE COSTUME CONTEST!* *
A) 30m: Costume Guessing Contest: for Extra Credit Points
60m: Lecture: Natural History before Darwin;
(No formal break today)
B) 30m: Discuss Darwin reading and study sheet questions
45m: STUDENT PRESENTATIONS (on Darwin and related topics)

19. _____ / 20. _____

21. _____ / 22. _____

Background Reading: Baigrie, *SR* 151-156 (Linnaeus); 209-225 (Hutton), 239-246 (Cuvier)
Hankins, Chp 5: pp. 113-157 (*on 2 hour reserve*)
Darwin: Intro.and selections from *Origin* and *Descent*: pp. 3-20; 87-94, 95-135; 175-213; 243-254.
Optional Reading for Extra Credit: Baigrie, 251-165 (Lyell), 285-322 (Darwin)

wk 12: F. Nov 5:
A) 75m: Lecture: The Experience of Experiment in the Biological and Physical Sciences
Break
B) 1.15m: STUDENT PRESENTATIONS

23. _____ / 24. _____

25. _____ / 26. _____

27. _____ / 28. _____

Background Reading: Baigrie, S*R*, 115-132, 157-174, 195-208;
Dear, Chp 2: 39-66 (Classification); Chp 4:91-114 (Design/Disorder); Chp 5: 115-140 (Dynamical Explanation)
Hankins, Chp. 3: pp.46-80 *(on 2 hour reserve*)
Shapin, Chp. 2: pp. 65-114 (How Was it Known?)

wk 13 F. Nov 12:
A) 30m: Discuss *The Double Helix*
(No formal break today)
B) 120m: View and Discuss film: The Race for DNA (hand in viewer response sheet)

Discussion Reading: Watson, *The Double Helix* (whole book)
Background Reading: Shapin, Chp 3, 119-165 (What Was the Knowledge For?)

wk 14 F. Nov. 19: *Women in Science* * POLISHED, REVISED PAPERS or LESSON PLANS DUE *
A) 30m: Discuss Reading: Women in Science (*on electronic reserve*)
50m: View and Discuss: *Discovering Women: High Energy Physics* (Melissa Franklin)
Break
B) 75m: View and Discuss: *Discovering Women*: biology

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

HAPPY THANKSGIVING!

wk 15: F. Dec 3: *Having Fun with Science!*
A) 75m: Discuss Feynman (whole book)
Break
B) 75m: view and discuss Nova "Greatest Mind Since Einstein"

Discussion Reading: Feynman, *"Surely, You're Joking, Mr. Feynman!"* (whole book)

* Final Exam: Fri. Dec 10: 2 hour EXAM, objective section only

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.

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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 WebCT for additional messages or postings (which may supercede info. on this syllabus).

FOR ADDITIONAL APPLICABLE UTD POLICY STATEMENTS SEE:

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

ADDITIONAL RECOMMENDED TEXTS (Tip of the Iceberg!)
for PAPERS and PRESENTATIONS
FOR
HUHI 7368 and HIST 3328
FALL 2010

History of Ancient and Medieval Science and Medicine

1. Lindberg, David *The Beginnings of Western Science* (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 SanFrancisco; 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