

Modern science amounts to an ongoing inquiry into what we know and what we remain ignorant about in the universe. Seen as a journey from the past, scientists' endeavors are a pathway littered with signs appearing as mileposts that both alert and confuse the traveler concerning how far we must yet travel to solve underlying mysteries of material existence.

This class is an inquiry into the meaning of a few great contemporary ideas in the history of science in the last two centuries that alert us to our own dubious role in the origins, essence and character of experience. Our discourse is built around the great intellectual revolutions that mark the development of scientific thought, particularly the events associated with Newton, Darwin, Freud and Einstein who were great harbingers of our modern worldview.

The course explores the concept of empirical knowledge as one revolutionary ingredient in natural history and natural philosophy. By emphasizing the importance of how and when scientists change their ideas about existence, our pursuit encourages you to reflect on how we acquire knowledge of the universe. We examine milestones in detail in the popular works of Feynman and Kaku in physics, Mayr, and Margulis in biology. These books relate to the earlier milestones representing the contributions of Kepler, Darwin, and geneticists.

Through the use of primary documents, commentaries, poetry, plays and allegories this investigation of contemporary scientific thought's foundations conveys both the complexity of technical details and the simplicity of methods used to distinguish errors from certainties about nature. Thus we explore the treatment of science in rhetoric, literature, and drama.

To demonstrate this dual character of science three thematic threads through this labyrinth of physical existence are represented by the words: **Cosmos** (□□□□□□□□ **Bios** (□□□□□ **Lux** (□□□□ **Order, life and light**, respectively, are applied to the course's numerous details as an organizational framework. This orderliness conveys the pervasive magnitude of science's contributions to the intellectual, commercial, political, social, and moral life of our times.

Required Texts

- Mircea Eliade, **The Sacred and the Profane.**
- Richard Feynman, **The Meaning Of It All.** ✓
- Bertolt Brecht, "**Galileo.**"
- Deirdre N. McCloskey, **The Rhetoric of Economics.** ✓
- Rene Dubos, **The White Plague.**
- Leo Marx, **The Machine in the Garden.** ✓
- Ernst Mayr, **One Long Argument.** ✓
- David Bainbridge, **The X in Sex: How the X Chromosome Controls our Lives.** ✓
- Lynn Margulis, **Symbiotic Planet.** ✓
- Karen Horney, **Neurosis and Human Growth.** ✓
- Michio Kaku, **Beyond Einstein.** (Anchor Books; RANDOM House, 1995). ✓
- Michael Frayn, "**Copenhagen.**"

Dramas: Bertolt Brecht, *Galileo.* & Eric Bentley's essay.
Michael Frayn, *Copenhagen.*

✓ Books about which you may write response papers (*See page three*).

Assignments	short description	value	due
Attendance:	active participation, discussion & answering questions	20%	
2 short essays:	respond to primary works of your choice {10% each}	20%	see p. 3
Midterm Essay:	what is your worldview & how is science's zeitgeist different?	25%	3/6
Research Paper:	about an approved scientific topic of your choice	25%	4/10
Final talk:	verbally describe your research thesis and findings	10%	4/24-5/1

All assignments are graded with respect to the following criteria:

- c** clarity - grammar, syntax, usage, logical progression, conceptual consistency & imagery.
l length - development of ideas, the extent of your evidence and argument in concise prose.
i informative value – the body of evidence you examine, discover, explain, and convey.
f frequency of reference to texts - the actual discussion of ideas and thoughts in the books.
s summaries - an ability to link one set of ideas to another and summarize in supported conclusions.

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Spring Calendar

Wk	date	Reading or topics	remarks	assignments
January				
17		Who are we, & what ought we to know about this world? <i>zeitgeist</i> & themes of Cosmos, Life, & Light .		
24		Cosmic worldviews and hierophany , <u>The Sacred and the Profane</u> , by M. Eliade. Research ideas due.		
31		Describing a cosmos: Brecht , " <u>Galileo</u> " & <u>The Rhetoric of Economics</u> , D. McKloskey, pp. xi-34. 107-111.		
February				
7		Worldviews, <i>zeitgeist</i>, & methods: <u>The Meaning of it All</u> , R. Feynman		
14		<u>The Machine in the Garden</u> , by Leo Marx. Do worldviews shape technology? Research proposal due.		
21		Life: <u>The White Plague</u> , by Rene Dubos the personal quest for health and public <i>sanitas</i> .		
28		Life: Shattering complacent worldviews & Ernst Mayr, <u>One Long Argument</u> .		
March				
6		Life: <u>The X in Sex: How the X Chromosome Controls our Lives</u> by David Bainbridge. Essay Due		
13		Spring Break:		
20		Life, its five or six kingdoms? and Lynn Margulis, <u>Symbiotic Planet</u> . Research bibliography due.		
27		The human predicament and Karen Horney, <u>Neurosis and Human Growth</u> .		
April				
3		Light: quantum relativity's paradox & <u>Beyond Einstein</u> , by Michio Kaku		
10		Michael Frayn, <u>Copenhagen</u> . Research Draft due.		
17		Microcosm: quarks, genes & <i>uncertainty</i> in our post-modern <i>zeitgeist</i> : Ernst Mayr, <u>One Long Argument</u> .		
24		FINAL oral presentations, a 5-minute, succinct rehearsed talk to us. Reports on research essays concerning a profound scientific idea: What did you learn?		
May 1		FINAL oral presentations, a 5-minute, succinct rehearsed talk to us. Reports on research essays concerning a profound scientific idea: What did you learn?		

Welcome to our inquiry about the great ideas, discoveries and influences in science that have shaped our current knowledge of the order, origins and behavior of existence.

Science is that facet of the quest for order, meaning and predictability in reality, dominating our lives today. As the heirs of an unfathomable ancient legacy of dreams, mistakes and hunches gone wrong, modern science is a method of detecting errors as we discover a sublime meaning to our conscious existence in an immense universal emptiness.

What must you accomplish in this class? value.

Attendance, speaking in class about questions from the texts, active participation: **20%**

Two Response papers (short): 2-3 pages typed (books of your choice) due the days indicated: [Feynman, 2/7; Marx, 2/14; Dubos/White Plague, 2/21; Mayr, 2/28; Genetics, 3/6; Margulis, 3/20; Horney, 3/27; Kaku, 4/3.]

20%

Mid-term essay (long) : 6-7 pages typed, **due 3/6**: How have ideas associated with Newton, Darwin, Einstein, or technology changed your thoughts about the cosmos? **Use the texts** (Eliade, Feynman, Brecht, Bentley, McCloskey, Marx, Mayr) to support your views.

20%

Term-long research paper on a scientific topic of your choice: 10-12 pages typed (excluding the footnotes, timeline & bibliography); use the readings to support your views!

Thesis statement & timeline due	2/14	1%
Abstract and bibliography due	3/20	4%
Orally report on the essay	4/24 or 5/1	10%
Final draft due	4/10-17	20%

Thesis statement & timeline due: one page typed, a paragraph and ten to twelve dates explained.

Abstract and bibliography (due 3/20) one page abstract on the scope and focus, an annotated bibliography of at least six sources not from the world wide web and three or four from the web.

Orally report on the essay, a rehearsed 5-minute concise oral presentation discussing what you learned about a significant scientific idea of some importance. (4/24 or 5/1)

Final draft due – for every web based source of information you should have two print research sources, preferably one from a periodical and one from a book (4/10-17). I return these drafts to you and you have until 5/1 to turn in the redraft –should you chose to do so.

I assume that all work that you submit for my review is original and that you give clear and ample credit to the authors of those concepts and ideas that are not original with you and thus, that you borrow, embellish or examine. Unless you give clear credit to the views of others, you are guilty of fraud, and a punishable wrong called plagiarism.

Both the **Study Guide** (posted on the MLS web page) and many sections of **my web site** are there for you to use and refer to with respect to definitions, the times and people we are studying.

If you would like to have and get credit for a threaded discussion in the class, please let me know so that I can set that up in Blackboard, a software program the College hosts for just such a purpose.

The history of science is studied: internally as discoveries or externally as social influences.

Twin Dialectical Perspectives		
<i>methods of science</i>		
<i>subject of study</i>	analytical	synthetic
macrocosm [universe]		
microcosm [quantum]		

You may select any topic related to science, biographies of scientists or the influence of events on science or science on events as a focus of your research. The ideal is for you to write a research essay of some length to inform us about some important facet of science.

Although any topic that has a corresponding article in Scientific American, or Nature, or Isis, or Zygon, may be the focus of your term-long research paper here are some suggestions for you to consider. **Both you and I should concur on any choice you make:**

Internal history of science (ideas about the accurate rendering of nature)

- What are revolutions in science? (Thomas Kuhn and I. Bernard Cohen)
- Was Galileo or the Church more wrong in the trial of Galileo in 1633?
- How is cosmology different today from Newton's time? (Hawking,
- Who was Isaac Newton and what did he achieve in his lifetime? (Christianson)
- Who were the precursors of Darwin? (Eisley)
- How did Darwin change our view of life? (Gould, Mayr, Ghiselin)
- Conquest of chemistry compounds [search for a periodic table of elements]. (Lavoisier, Mendeleev)
- What did Marie and Pierre Curie accomplish? ($E=Mc^2$)
- How time and space are depicted in western thought as opposed to eastern concepts (Capra).
- What is the measure of matter in the Quantum universe? (Hawking, Lederman, Gell-Mann)
- The coming of genetics and twentieth century ideas of inheritance (Watson, Lewontin, Keller).
- The search for the molecules of inheritance, Rosalind Franklin & Barbara Maclintock.
- Reductionism & specialization in science, (some specific example of); 1780-1980.

External history of science (influences of scientific discovery on society)

- Did the Renaissance create scientific thought or did scientific practices create a renaissance?
- Newton, the bible, and a mechanistic view of God as clockmaker.
- Was the secularization of modern society due to science or due to commercial culture?
- Women's work and "separate spheres" as a response to professional specialization in 19th century.
- The Industrial Revolution as a fruit on the Newtonian tree of science (Leo Marx).
- Opposition to Darwin from the scientific and religious communities.
- Social Darwinism and the reconfiguration of ethnic politics 1860-1960.
- Atomic scientists and the uses of power and policy of mass destruction 1939-1999.
- Eugenics and the perfection of the human race 1880-1950.
- The rise of an ethical concern for wildlife, animals and our Earth (Rene Dubos).
- The loss of species and the destruction of ecosystems (E. O. Wilson).
- The influence of empirical science on applied science, technology & engineering (Leo Marx).