HI 481: HISTORY OF THE LIFE SCIENCES

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OFFICE HOURS: Monday 10:45 - 12:00
Wednesday 10:45 - 12:00, 3:00 - 4:30
and by appointment

Syllabus & Readings & Updates at go.ncsu.edu/hi481

Course Prerequisite: 3 hours of History

HI 481 fulfills the “Interdisciplinary Perspectives” category of the General Education Program. The course will help you to distinguish between the distinct approaches of history and science, identify and apply the connections between them, and explore and synthesize the views of the two disciplines as we examine modern ideas about living processes.

The course treats the growth of biology as a story about developing a set of core ideas or organizing concepts about the nature of life. Starting in the 1600s, investigators learned how to experiment on living functions. Over the next two centuries they developed a view that life is explained by structure (organs, tissues, cells, molecules) and function (chemistry). As new tools and methods provided control and precision, a biology of physiology, development, and heredity went from promise to the flourishing of molecular biology. On an overlapping track, naturalists developed the sciences of the ecological interactions, deep history, and evolution of life. Ideas never exist in a social vacuum, and so the course will draw attention to the connections between the life sciences and other aspects of culture, including beliefs, professional behavior and practices, and social goals.

Biology today is one of most rapidly developing sciences, and its implications promise to be profound. As educated citizens, you ought to become aware of the history of the ideas that form the modern, biological view of life. This course is intended to provide you with the chance to develop an understanding of biological and biomedical ideas and practices as they developed, and provide material for your own reflections on this view of life.

In trying to explain the development of biological science, the historian asks some basic questions:

• What did people know about the biological phenomenon? This includes what they thought they were seeing, how they described it, how it connected to other things they knew. What was their explanation?
• How did they know all that? This means understanding the earlier scientist’s method of working and explaining, and also how other scientists were persuaded.
• Who developed the ideas? The narrative of scientific ideas is an account of creativity and insight, which also means it’s an explanation of the cultural and intellectual conditions that allowed or fostered the work. The story is by turns peculiar, obvious, ironic, tragic, funny, unexpected, twisted, or noble. Seldom is it boring.

Lectures will organize the major themes and provide a narrative about the scientists as background and guidance. You’ll read extracts from the original works of biologists, for discussion and essays. Together, lectures and discussions of the readings will provide the foundation for a historical view of biology.
Required texts:
William Harvey, On the Motion of the Heart and Blood in Animals (R. Willis translation of 1847, Prometheus Books, 1993)
Claude Bernard, Introduction to the Study of Experimental Medicine (Dover, 1957)

* Harvey, Bernard, and the Darwin books are available online:
  Harvey at the Internet Archive
  Bernard at the Internet Archive

You will need the Norton Critical Edition of Watson, and not one of the many other versions.

Additional readings will be online at <http://www4.ncsu.edu/~kimler/hi481/481readings.html>

Attendance at class sessions is essential. Your responsibility to the class is to attend and to be familiar with the readings, able to discuss their content, and ready to explore ideas in class. In addition, you are responsible for material covered in class, independent of the readings. Much class material will be my synthesis of the scholarship, and you’ll be expected to be able to draw on class discussions in your own written work.

This Syllabus is also a work in progress – you are responsible for keeping up with changes made in class for our topics or readings, and posted online at <http://www4.ncsu.edu/~kimler/hi481/481syllabus.pdf>.

Grades will be based on
20% : Reading Response comments, due at the class session indicated in the schedule of reading assignments. Responses should be less than 300 words. As these comments coordinate with the class sessions, no late papers are accepted. You will write 15 of these, out of 27 choices. The Schedule of Topics & Readings indicates the nine readings that you must write on; the others are your choice. Pick a major feature of the author’s argument to summarize in your own words. Point out something that strikes you as interesting, perplexing, disgusting, amusing, or curious about the text, as a prompt for class discussion.

60% : Review Essays. You will write three, with a choice provided every few weeks. You must submit one for each part of the course.
20% : Final Review Essay on Watson’s account and an alternative version, due on December 1.

Grading scale:
A+ 97-100  B+ 87-89.9  C+ 77-79.9  D+ 67-69.9  F  <60
A  93-96.9  B 83-86.9  C 73-76.9  D 63-66.9
A- 90-92.9  B- 80-82.9  C- 70-72.9  D- 60-62.9

Help on papers:
• I am available in office hours to help you with any problems you have with lectures, readings, or exam study questions.
• As many of you are not History majors, you might not know what to expect for an essay. I am
happy to discuss a draft of the essay in person. We can look for proper focus of the essay, general problems with writing and expression, and standards of historical writing. Obviously, you should plan ahead with due date in mind. Essays are due in class on the assigned date.

- You might find it useful to consult Jules Benjamin's *A Student's Guide to History*, for its tips and examples on writing for History assignments. It is available on Reserve in the Library's Textbook Collection (Ask Us Center).

**Absences and Missed Assignments:**
- Essays are due in class on the assigned date. You should discuss any problems in meeting the schedule with me before the due date.
- You should contact me as soon as possible, but not more than one week after the return to class, about absence on exam or essay dates because of illness or emergency. I will arrange the make-up date in consultation with you.
- Make-up work for planned excused absences must be arranged with Dr. Kimler before essay due dates. Consult the University's Attendance Regulation for the definition of excused absence.

**Academic Integrity:**
I have come to expect the highest integrity from NC State students. Students are bound by the policy on academic integrity as state in the NC State University Code of Student Conduct.
- You are required to uphold the Honor Pledge ("I have neither given nor received unauthorized aid on this test or assignment."). and your adherence to academic honesty is certified by your name on the test or assignment.
- It is your responsibility to know what constitutes plagiarism and avoid it. If you have any questions about what is appropriate scholarly use of sources and citation, see the History Department's guide "Plagiarism and the Honor Code".

**Scholarly forms of citation** in historical writing are not trivial. I require citation in “Chicago Style” in footnotes with a Literature Cited section at the end of the paper. The *Chicago Manual of Style* is available on-line <http://www.chicagomanualofstyle.org/home.html>. I do not accept in-text citations (parenthetical MLA or “scientific” format).

**Credit Only:**
Students taking a course S/U must complete all assignments and earn a grade of at least C-.
Credit Only courses can be included only under the Free Electives category of your curriculum, not for a major or a minor. The deadline for conversion from letter grading to Credit Only (S/U) is October 13.

**Disability Accommodations:**
Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office at Suite 2221, Student Health Center, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation.

**Students are responsible** for reviewing the NC State University policies and regulations which pertain to their course rights and responsibilities:
• Equal Opportunity and Non-Discrimination Policy Statement
  https://policies.ncsu.edu/policy/pol-04-25-05 with additional references at
  https://oied.ncsu.edu/equity/policies/
• Code of Student Conduct  https://policies.ncsu.edu/policy/pol-11-35-01
• Grades and Grade Point Average https://policies.ncsu.edu/regulation/reg-02-50-03
• Credit-Only Courses https://policies.ncsu.edu/regulation/reg-02-20-15
• Audits https://policies.ncsu.edu/regulation/reg-02-20-04
AUG 16  The Modern Biological View of Life  
Scientific ideas about living processes, and the nature of modern science.

AUG 21  Envisioning Living Structures and Function  
The early medical tradition. The role of illustration in medical texts. Vesalius and the Padua anatomists.  
READ: Illustrations slide sets  
READ & RESPOND: Vesalius, extracts from *De humani corporis fabrica*

AUG 23  Experimental Investigation  
Harvey’s methods of research.  
READ & RESPOND: Harvey, *On the Motion of the Heart and Blood* – thru Ch. 4

AUG 28  Demonstration and Experimentation  
Harvey’s arguments for the circulation of the blood.  
ALL READ & RESPOND: Harvey, *On the Motion of the Heart and Blood* – thru Ch. 14

AUG 30  Experiment and Its Limits  
Descartes and reductionist methodology. The nature of digestion.  
READ & RESPOND: Redi, *Experiments on the Generation of Insects*  
READ: Foster, *Lectures on the History of Physiology* (early mechanists)  
Gasking, *The Rise of Experimental Biology*  
Holmes, “The Physical Sciences in the Life Sciences” (thru p. 226)

SEP 6  Mechanism as Function  
READ: Roe, “The Life Sciences” (18th century)  
Broman, “The Medical Sciences” (18th century)  
Vaucanson, “An Account of the Mechanism of an Automaton”  
READ & RESPOND: Morgagni, *On the Seats and Causes of Disease*

SEP 11  The Material View of Life: New Organic Chemistry  
Magendie's chemical view. Analytical organic chemistry and drug synthesis. Agricultural and medical chemistry.  
READ: Holmes, “The Physical Sciences in the Life Sciences” (continuation)  
Foster, “The Condition of Physiological Science before Bernard Began His Labours”  

SEP 13  Disease and Public Health  
Disease theories, contagion, sanitation.  
READ & RESPOND: Chadwick, *On the Sanitary Condition of the Labouring Population* (pp. 369-73)

SEP 18  Contagion and Epidemiology.  
READ & RESPOND: Snow, *On the Mode of Communication of Cholera*

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SEP 20  Cells and a Chemical View of Life
The cell doctrine. Pasteur and the physiological unity of living processes.
READ: Virchow, *Cellular Pathology*
READ & RESPOND: Pasteur, “Memoir on the Organized Corpuscles”

SEP 25  Pathology & Germ Theory
The new bacteriology and lab biology.
READ: Amsterdanksa, “Microbiology”

SEP 27  Biology as an Experimental Science
ALL READ & RESPOND: Bernard, *Introduction to the Study of Experimental Medicine* [PART 1]

OCT 2  Methods for the Experimental Study of Physiology
ALL READ & RESPOND: Bernard, *Introduction to the Study of Experimental Medicine* [PART 2 or 3]

OCT 4  The Ecological Web
Economy of Nature and natural theology.
READ & RESPOND: Linnaeus, extract from *The Economy of Nature*

OCT 9  The History of Life
Ideas of progress and unity. Naturalistic explanations.
READ & RESPOND: Lyell, extract from *Principles of Geology*
Buckland, extract from *Geology and Mineralogy*
Miller, extract from *The Old Red Sandstone*
READ: Hodge, “Evolution”

OCT 11  Problems of Natural History
Darwin’s field investigations. The context of innovation.
ALL READ & RESPOND: Darwin, *Autobiography*

OCT 16  Creating a Theory of Evolution
Theoretical inquiries: heredity and adaptation. The evolutionary tree. The theory of Natural Selection.

OCT 18  Darwin’s Theory of Evolution
The argument of *The Origin of Species*.
ALL READ & RESPOND: Darwin, *Origin of Species* extracts – Introduction thru Ch. 6

OCT 23  Unifying Biology
ALL READ & RESPOND: Darwin, *Origin of Species* extracts, Ch. 8 thru 14

OCT 25  Reactions to Evolution
ALL READ & RESPOND: Contemporary reviews of *Origin*
READ: Haeckel, *The History of Creation*, Ch. 1
OCT 30 Investigations of Heredity
READ & RESPOND: Goodale, The Principles of Breeding

NOV 1 Mendel's Innovation
Mendel's methods and reception. Factorial and blending theories of heredity in 19th century.
READ & RESPOND: Mendel, “Experiments in Plant Hybridization”

NOV 6 The “New Experimental Biology”
The experimentalist revolt against morphology. Intellectual and institutional contexts of the new biological disciplines.

NOV 8 The Invention of “Genetics”
The creation of Mendelism. The Morgan school of classical Mendelian genetics. Lingering vitalism.
READ & RESPOND: Morgan,"What Are 'Factors' in Mendelian Explanations?"
Morgan, extract from The Physical Basis of Heredity
Haldane, extract from Mechanism, Life, and Personality

NOV 13 Directions in Genetic Research
READ: Burian and Zallen, “Genes”
Allen, “The Origin and Development of Molecular Biology”

NOV 15 The Nature of the “Gene”
Delbrück, Schrödinger, and the movement of “romantic” physicists.
READ & RESPOND: Schrödinger, What Is Life?

NOV 20 The Discovery of the Structure of DNA
The narrative and character of James Watson.
ALL READ & RESPOND: Watson, The Double Helix

NOV 27 Narratives of Discovery
Pauling, Watson, Crick and model-building. The role of Franklin.
ALL READ & RESPOND: individually assigned selections of alternative accounts

NOV 29 Narratives of Discovery
The nature of scientific practice and discovery.