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

Course Prerequisite:
Jefferson Scholar [or by permission from Dr. Kimler, with Junior standing and Honors GPA].

General Education Program fulfillment:
This course is on the list for “Interdisciplinary Perspectives” courses. 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) 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 religious beliefs, professional behavior and practices, and social goals.

In trying to explain the development of biological science, the historian asks some basic questions:
1. What do we know about the biological phenomenon? This includes what we think we’re seeing, how we describe it, how it connects to other things we know, and some explanation of its causes or operations.
2. How do we know all that? This means understanding the scientist’s method of working and explaining, and also how other scientists have been persuaded of this answer.
3. Who figured it out? The story 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. It is also by turns peculiar, obvious, ironic, tragic, funny, unexpected, twisted, or noble. Seldom is it boring.

Biology today is one of most rapidly developing sciences, and its implications for modern life 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.

Lectures 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. Together, lectures and
discussions of the readings will provide the foundation for a historical view of biology.

**Readings** are online at <http://www4.ncsu.edu/~kimler/hi481/481readings.html> and also come from the required texts:

  On Reserve: QP101 .H3613 1993  
  Also available from the Internet Archive https://archive.org/details/b226511135

  Also available from the Internet Archive https://archive.org/details/pdfy-d2FfzgxId4Qs9mR4

  The same 1859 text is also available from The Complete Work of Charles Darwin Online: http://darwin-online.org.uk/content/frameset?viewtype=side&itemID=F373&pageseq=1

  The same 1958 restored text is also available from The Complete Work of Charles Darwin Online: http://darwin-online.org.uk/content/frameset?itemID=F1497&viewtype=text&pageseq=1

  Also available from the Internet Archive https://archive.org/details/in.ernet.dli.2015.463298

  You will need this Critical Edition for its extra materials.

**Attendance** at class sessions is essential and required.  
- 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.  
- 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

**30% : 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 20 of these, out of 29 choices. The Schedule of Topics & Readings indicates the **10 readings that you must write** on; the other 10 are your choice. Pick a major feature of the author’s argument, presentation, or ideas to summarize in your own words, as a prompt for class discussion.
30% : Take-home Review Essays.
• I am available in office hours to help you with any problems you have with the essays. As most 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.
• An Essay should be 1000 to 1500 words (4 to 6 pages). A good “review” essay presents a clear and sophisticated thesis - you have a coherent thematic point to make that organizes the essay, and provide supporting details for a focused historical explanation. Typical themes the historian might present include an overall trajectory to a development, a unifying idea seen throughout the time period, or a persistent problem or dilemma facing biologists. For example, you might organize an explanation of Harvey’s work with a theme on his need to develop and present a logic for overturning the ancients and defending his new way of studying the heart. Don’t just march through the sources – organize your presentation thematically.

Support your discussion with examples from the text that show your point. The best kinds of detail go directly to support your themes, or illustrate the lesson you’re trying to draw. In particular, check that your points or conclusions have details that support them, and that any details you include serve some point you make. Extraneous detail distracts. And in a review, you are hardly expected to cover everything one could say. I’d rather have good interpretive ideas and insights, well-supported with some of the material.

It’s always nice when the essay is well-written, with the emphasis here on clarity and simple grace. If it flows along, leading by smart examples from point to point, your reader will find it rich in content and compelling to read.
• Use the Chicago Style for footnotes.

You will write on two of these questions:

Choice #1. Due January 25. Analyze William Harvey’s argument in On the Motion of the Heart and Blood — you might consider such matters as his logic, the strategic way that he builds his case, the types of evidence he uses, its novel or traditional aspects, or how the rhetoric of argumentation serves to advance his promotion of new knowledge.

Choice #2. Due February 13. Drawing on Johnson’s study and Snow’s treatise, discuss the nature of the problem of infectious disease, epidemics, and discovery of the nature of waterborne illness.

Choice #3. Due February 22. Discuss Claude Bernard’s argument on the status and logic of “experimental medicine” [modern laboratory methods], considering his points about how to make biology a proper science, the logical or reasoning involved in experimental practice, and the proper behavior of a true scientist.

Choice #4. Due March 27. Discuss the presentation of the “one long argument” that Charles Darwin makes for evolution in his Origin of Species — you may focus more on his reasoning and how he presents it, or more on the rhetoric of a persuasive case (including how readers responded to his treatise).

Choice #5. Due April 25. Analyze James Watson’s presentation in The Double Helix of Watson and Crick’s accomplishment, addressing a clear thematic question of your choice —
such as the nature of their discovery, their style of collaboration and competition, questions of scientific integrity, or the role of Franklin or others in the discovery. Overall, I expect a historian’s critique of Watson’s “memoir.” I will expect you to be aware of the various criticisms of the text or disagreements with or alternatives to Watson’s version (Stent’s chapter on the reviews will give you the quick overview). You will need to explicitly address the perspective of at least one of these views.

30% : Research Paper of at least 2500 words [10 standard pages] in length, plus literature cited. In general, the paper will be an investigation of the development or impact of a particular idea, individual, technique, or institution in the history of biology, with preference given to a topic connected to your CALS major. But you may also investigate a different area of biology. I will discuss with you possibilities for papers, and must approve your choice of a topic. I will expect you to have picked a topic and discussed sources with me by March 1.

The finished version of the Research Paper is due by 11 a.m., Tuesday, May 8.

10% : Submission of Research Paper Draft and Comments on classmate’s draft. I will be happy to discuss literature searching and materials you find as you research and write.

Draft:
A Draft version of the Research Paper is due to me by March 29. By draft, I expect a well-formed research question, a close-to-complete search for sources, detailed coverage of your sources, and an attempt at your final analysis and conclusion. On any topic, I expect you to incorporate the course’s insights about the developments of biological science. If there are parts of the paper not finished because you are waiting on a source or are still trying to figure something out, just indicate so in the draft with an outline of what you might fill in for that section. The purpose of a draft, after all, is to find the holes to be filled by more sources or analysis. It also allows a reader to see what’s missing.

Comments:
Each of you will review one classmate’s Draft. The Comments are due in class on Thursday, April 5.

After reading the Draft, you ought to be able to summarize the main thesis of the paper – the historical question being posed and a succinct version of the explanation provided. A history paper is essentially a narrative with explanation that points out some issue or conditions or event of interest. It then uses particular sources as evidence for an explanation of why it occurred in the way it did, or explains the particular context of the issue.

Thus you can help your classmate by writing, in your own words, a brief account of what the paper raises as a question, what it covers as narrative and evidence, and what the overall explanation is. If you have trouble seeing those things in the paper, your critique should point out where and why you had trouble with the question or argument. Even just seeing the topic and explanation described in someone else’s words can help the writer to clarify what they’re trying to say, or notice relative emphasis throughout the paper.

Make suggestions for improvement – clarifying the question or point of the paper, and strengthening the explanation or conclusions. You might not be convinced of a claim in the paper – point out why not, even perhaps what it would take to be more convincing. You may wish to point out where you’d like more evidence for particular claims, or even suggest subjects or sources that you think would help with the writer’s particular interest. It
is not your job to correct grammar or style, although you might indicate where the organization or text is not clear.

Keep in mind that the paper is the author's intellectual property and you may not use it, share it with others, post it to the web, tweet about it, turn it into a video on YouTube (with or without kittens), or anything else that violates their inherent copyright. It should go without saying that you will treat your classmate's work with respect and discretion, making helpful suggestions. I will consider any disrespect to be a violation of the standards of integrity of an academic community, and treat accordingly.

I expect you to consider comments from your classmates and from me in your revisions.

Grading scale:

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Absences and Missed Assignments:

• Reading Responses and 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 because of illness or emergency.
• Make-up work for planned excused absences must be arranged with Dr. Kimler before due dates. Consult the University's Attendance Regulation for the definition of excused absence at [http://policies.ncsu.edu/regulation/reg-02-20-03](http://policies.ncsu.edu/regulation/reg-02-20-03).
• You are allowed two unexcused absences. Each additional unexcused absence will reduce your final grade by 3 points.

Academic Integrity:
I have come to expect the highest integrity from NC State students. I assume that you are familiar with NC State policy on Academic Integrity, found in the Code of Student Conduct, at [http://policies.ncsu.edu/policy/pol-11-35-01](http://policies.ncsu.edu/policy/pol-11-35-01). 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.

Scholarly forms of citation in historical writing are not trivial, and every publisher has its own requirements. I require citation in footnotes, with a Literature Cited section at the end. I do not accept in-text citations (parenthetical MLA or “scientific” format). Citation format must follow *The Chicago Manual of Style*, available on-line [http://www.chicagomanualofstyle.org/home.html](http://www.chicagomanualofstyle.org/home.html) and in Cindy Levine’s Library Course Tools for History.

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 tips on avoiding plagiarism at [https://history.ncsu.edu/undergrad/plagiarism.php](https://history.ncsu.edu/undergrad/plagiarism.php). Or talk to me.

Disability Accommodations:
Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, you 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 at <http://policies.ncsu.edu/regulation/reg-02-20-01>

**University Policies:**

Students are responsible for reviewing the NC State University Policies, Regulations, and Rules which pertains to their course rights and responsibilities:

- Code of Student Conduct [https://policies.ncsu.edu/policy/pol-11-35-01](https://policies.ncsu.edu/policy/pol-11-35-01)
- Grades and Grade Point Average [https://policies.ncsu.edu/regulation/reg-02-50-03](https://policies.ncsu.edu/regulation/reg-02-50-03)
- Credit-Only Courses [https://policies.ncsu.edu/regulation/reg-02-20-15](https://policies.ncsu.edu/regulation/reg-02-20-15)
- Audits [https://policies.ncsu.edu/regulation/reg-02-20-04](https://policies.ncsu.edu/regulation/reg-02-20-04)
JAN 9  The Modern Biological View of Life
Scientific ideas about living processes, and the nature of modern science.

JAN 11  Envisioning Living Structures and Function
The early medical tradition. The role of illustration in medical texts. Vesalius and the Padua anatomists.
REVIEW: Illustrations slide sets
ALL READ & RESPOND: Vesalius, extracts from De humani corporis fabrica

JAN 16  Experimental Investigation
Harvey’s methods of research.
READ & RESPOND: Harvey, On the Motion of the Heart and Blood – thru Ch. 4

JAN 18  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

JAN 23  Experiment and Its Limits
Descartes and reductionist methodology. The nature of digestion.
READ & RESPOND: Redi, Experiments on the Generation of Insects
RESOURCES: 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)

Review Essay #1 due January 25

JAN 25  Mechanism as Function
READ & RESPOND: Morgagni, On the Seats and Causes of Disease
RESOURCES: Roe, “The Life Sciences” (18th century)
            Broman, “The Medical Sciences” (18th century)

JAN 30  The Material View of Life: New Organic Chemistry
Magendie's chemical view. Analytical organic chemistry and drug synthesis. Liebig and agricultural and medical chemistry.
READ & RESPOND: Liebig, Animal Chemistry (Preface & I, thru p. 9)
            Foster, “The Condition of Physiological Science before Bernard Began His Labours”

FEB 1  Disease and Public Health
Disease theories, contagion, sanitation.
READ & RESPOND: Chadwick, On the Sanitary Condition of the Labouring Population (pp. 369-73)
            Snow, On the Mode of Communication of Cholera
FEB 6      Contagion and epidemiology

FEB 8      Cells and a Chemical View of Life
The cell doctrine. Pasteur and the physiological unity of living processes.
READ & RESPOND:    Pasteur, “Memoir on the Organized Corpuscles”

Review Essay #2 due February 13

FEB 13     Pathology & Germ Theory
The new bacteriology and lab biology.
RESOURCE:    Amsterdamska, “Mictobiology”

FEB 15     Biology as an Experimental Science
ALL READ & RESPOND:    Bernard, *Introduction to the Study of Experimental Medicine* [PART 1]

FEB 20     Methods for the Experimental Study of Physiology
ALL READ & RESPOND:    Bernard, *Introduction to the Study of Experimental Medicine* [PART 2 or 3]

Review Essay #3 due February 22

FEB 22     The Ecological Web
Economy of Nature and natural theology.

FEB 27     The History of Life
READ & RESPOND:    Lyell, extract from *Principles of Geology*
                    Buckland, extract from *Geology and Mineralogy*
                    Miller, extract from *The Old Red Sandstone*
RESOURCE:    Hodge, “Evolution”

MAR 1      Problems of Natural History
Darwin’s field investigations. The context of innovation.
ALL READ & RESPOND:    Darwin, *Autobiography*

MAR 13    Creating a Theory of Evolution
Theoretical inquiries: heredity and adaptation. The evolutionary tree. The theory of Natural Selection.

MAR 15    Darwin’s Theory of Evolution
The argument of *The Origin of Species*.
ALL READ & RESPOND:    Darwin, *Origin of Species* extracts – Introduction thru Ch. 6

MAR 20    Unifying Biology
ALL READ & RESPOND:    Darwin, *Origin of Species* extracts, Ch. 8 thru 14

MAR 22    Reactions to Evolution
ALL READ & RESPOND:    Assigned contemporary review of *Origin*

Review Essay #4 due March 27
MAR 27  Investigations of Heredity
READ & RESPOND:  Goodale, *The Principles of Breeding*

MAR 29  Mendel's Innovation
Mendel's methods and reception. Factorial and blending theories of heredity in 19th century.
READ & RESPOND:  Mendel, “Experiments in Plant Hybridization”

DRAFT Research Paper due March 29
COMMENTS on classmate’s Draft due April 5

APR 3  The “New Experimental Biology”
The experimentalist revolt against morphology. Intellectual and institutional contexts of the new biological disciplines.

APR 5  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*

APR 10  Directions in Genetic Research
READ AND RESPOND:  Schultz, “The evidence of the Nucleoprotein Nature of the Gene”
RESOURCES:  Burian and Zallen, “Genes”
Furukawa, “Macromolecules”

APR 12  The Nature of the “Gene”
Delbrück, Schrödinger, and the movement of “romantic” physicists.

APR 17, 19  The Discovery of the Structure of DNA
The narrative, and the character of James Watson.
ALL READ & RESPOND:  Watson, *The Double Helix*

APR 24, 26  Narratives of Discovery
Pauling, Watson, Crick and model-building. The role of Franklin. The nature of scientific practice and discovery.
ALL READ & RESPOND:  individually assigned selections of alternative accounts

Review Essay #5 due Friday, April 27

MAY 8  Final Version of Research Paper due by 11:00 a.m.

Syllabus Version: 9 January 2018