

**History of Science 333: History of Modern Biology
Spring 2001**

Prof. Lynn K. Nyhart

Office: 7127 Social Science Bldg.

Office Hours: Weds. 1:30-3:15 and by appt.

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Format: Lecture/discussion

Meets: TR 9:30-10:45 in Social Science Bldg. 6228. In addition, graduate students will meet for further discussion, especially of historiographic issues, on Thursdays 11-12:30 in the History of Science Conference Room, Soc. Sci. 7130. Interested undergraduates are welcome to attend.

This year's course will focus on the history of biology since the mid-nineteenth century. The central stories will concern the history of genetics from its agricultural origins in the nineteenth century to the recent history of recombinant DNA and the history of evolution from Darwin's time through the 'new synthesis' in the mid-twentieth century up to the sociobiological 'synthesis' of the 1970s; some attention will also be paid to the rise of ecology. Through these stories, we will grapple with biologists' ideas about reductionism, holism, and levels of biological organization; analyze different modes of scientific practice (lab work, fieldwork, theorizing); and consider the institutional and broader social politics of biology as it has developed over the last century or so. Finally, we will also consider how these various themes are reflected in the ways that the history of biology has been written, by critically examining and comparing scientists' and historians' accounts.

Readings

Many readings for this course are provided in a reader, available for purchase at the History of Science departmental office, 7143 Social Science Bldg. One copy of this reader will be available in the History of Science Conference Room, 7130 Social Science, and the other will be on reserve at College Library.

The endnotes for Henig's book (see below) are also available for purchase at the department. If you buy the book, you should also purchase the notes, since they supply the scholarly apparatus that is missing from the book and turn it from a popular work into a serious one. (Here in academia, we like serious books—especially if they are as well written as popular ones!)

The following books are available for purchase at the University Book Store and the Underground Textbook Exchange, and a copy of each has been placed on reserve in College Library:

Everyone:

Ernst Mayr, *One Long Argument*

Peter J. Bowler, *The Non-Darwinian Revolution*

Robin Marantz Henig, *The Monk in the Garden*

Robert E. Kohler, *Lords of the Fly*

James D. Watson, *The Double Helix*

Edward O. Wilson, *Naturalist*

Grad students only:

Adrian Desmond and James Moore, *Darwin*

Lily E. Kay, *Who Wrote the Book of Life?*

Michel Morange, *A History of Molecular Biology*

Robert E. Kohler, "Labscapes and Landscapes: A Cultural Geography of the Lab-Field Frontier in Biology" (book ms. to be made available in reading room)

General Requirements: Because this course revolves in good part around discussions based on the reading, its success depends on its participants' having read the material carefully and being willing to talk about it. We will read both "primary" sources (writings by participants at the time) and "secondary" sources (writings by historians and scientists reflecting on what happened), with an emphasis on the latter. But note that one of the issues of the course surrounds exactly the blurriness of the line between primary and secondary sources!

Undergraduate Requirements:

Class participation (see below): 1/3

Two take-home essay exams (4-5 pages, **due Tues. Mar. 6 and Tues. April 12**): 1/6 each

Final paper (7-9 pages, **due Wed., May 16, by noon**): 1/3

Class participation: Your class participation grade derives from three sources: in-class discussion, reading responses and occasional in-class assignments, and participation in the two writing workshops. The weight of each part of these is not fixed, to allow, for example, shy students who are not aggressive discussants to demonstrate their thoughtful analysis of the readings in written form. I will pay close attention to attendance, since you cannot participate even passively in the course if you aren't there.

Reading responses: For each class you will receive a focus question or set of questions for you to think about as you read. These will be typically delivered to you by email no later than Sunday night of each week, covering both the Tuesday and Thursday class. (I will make every effort to send these out earlier.) You are required to turn in **one reading response in class every week** over the course of the semester (except for the first week). Each reading response should be no more than one page long (I prefer word-processed or typed, but handwritten is okay, so long as it is legible and in pen) and may be formulated in response to questions I pose or represent your own reactions to the readings and analysis of them. The idea is to get you to practice thinking through the material **BEFORE** you get to class. Therefore, you need to have the response ready to hand in at the beginning of the class that covers the readings you discuss. I will not accept reading responses handed in later than the class covering the relevant readings; if you have to email a response to me (e.g. if you need to miss a class), it must be sent before 9 a.m. the day of the class. Any additional reading responses can be counted as extra credit for your class participation grade.

Writing Workshops: The class before the first and second take-home essays are due will be devoted to workshoping a draft of your paper with a small group of students. The purpose of these workshops is for you to help one another clarify and tighten your arguments, and also to expose you to other perspectives on the questions. In answering essay questions, there is no one right answer; your essays will be judged on their logic, use of evidence, and organization, all of which together add up to making a persuasive case for the position you take. More details on the

writing workshops will be forthcoming closer to the first one.

For the final paper, students may choose between an essay based on a broad question provided by me or a research paper, the topic chosen in consultation with me. There will be no formal writing workshop for the final paper, but students are encouraged to share drafts, with me and/or with each other. If there is sufficient sentiment for it, I will set up a writing workshop time after the last class.

Honors Requirements: write both the final essay and a research paper.

Graduate Requirements: Reading: in addition to the general readings, we will be discussing 3 extra books and a book manuscript in our separate discussion. Please take note of their due dates. Writing: 20+ pages of scholarly prose (the undergrad 3 essay exams [slightly longer]; 4-5 book reviews; a bibliographic or historiographical essay to prepare for prelims; a research paper; or a dissertation proposal) as determined by your individual needs. Class participation is also factored into your grade (note that it is more important to say intelligent things than to talk a lot).

Topics and Assignments (readings marked with a * are in the photocopied reader):

1/23: Introduction: "Cultures" of Biology: Conflict, Cooperation, Growth, and Change over Time

Unit I: Darwinism and Mendelism; The Field, the Garden, and the Lab, 1859-1929

1/25: Darwin and the Darwinian Revolution

*Charles Darwin, *On the Origin of Species* (London: John Murray, 1959), Table of Contents (look through carefully), pp. 80-96, 459-490

Ernst Mayr, *One Long Argument*, pp. 1-47 (esp. 35-47)

Robin Marantz Henig, *The Monk in the Garden*, Ch. 9 (pp. 100-118)

1/30: Biological Theory and Practice after Darwin

Bowler, *The Non-Darwinian Revolution*, pp. 1-19, 47-90

Ernst Mayr, *One Long Argument*, pp. ~~40-55~~ 90-107

2/1: "Man's" Place in Nature, and Biology's Place in Late Nineteenth-century Culture

Bowler, *Non-Darwinian Rev.*, 131-~~151~~ 151

*Darwin, *The Descent of Man*, 2 ed. (New York: Hurst, 1874), pp. 80-81, 109-112, 194-197, 208-215, 579-589

*Evelleen Richards, "Redrawing the Boundaries: Darwinian Science and Victorian Women Intellectuals," in *Victorian Science in Context*, ed. Bernard Lightman (Chicago: U. of Chicago Press, 1997), 119-142

Grad Student discussion: Adrian Desmond and James Moore, *Darwin* [all]

2/6: Mendel in context: agriculture, commerce, and religion in central Europe

Henig, *Monk in the Garden*, 1-68

2/8: Was Mendel a “Mendelian”? What was he after?

Henig, *Monk in the Garden*, 69-99, 119-147

Take a look at Mendel's paper on: <http://www.netSPACE.org/MendelWeb/>

(How many sections does M's paper have? Which did you read? What did you find interesting? Confusing?)

2/13: The “Rediscovery” of Mendel’s Laws and the “Mendelian Revolution”

Henig, *Monk in the Garden*, 151-260, esp. **177-246**

Bowler, *Non-Darwinian Revolution*, 105-107, 113-125

*Hugo de Vries, “Evolution and Mutation,” pp. 1-26 in idem, *Plant Breeding* (Chicago: Open Court, 1907)

2/15: Experimentalists and Naturalists: Theories, Practices and Locations

*Lynn K. Nyhart, “Natural History and the ‘New’ Biology,” pp. 426-443, 490-491 in *Cultures of Natural History*, ed. N. Jardine, J.A. Secord and E.C. Spary (Cambridge University Press, 1996)

*David Magnus, “Theory, Practice, and Epistemology in the Development of Species Concepts,” *Stud. Hist. Phil. Sci.* 27 (1996): 521-533 (Note: this is parts I-IV of the article; the rest is to be read later.)

*Mark A. Largent, “Bionomics: Vernon Lyman Kellogg and the Defense of Darwinism,” *J. Hist. Biol.* 32 (1999): 465-488

For Grad Student Discussion: Kohler book ms. on naturalists

2/20: “Classical” Genetics and the Culture of the (Morgan) Lab

Robert E. Kohler, *Lords of the Fly*, pp. 1-55, 87-132

2/22: Translations and Transplantations: Genetics Between Europe and America

(Undergrads: receive Unit I Take-home essay questions)

*T. H. Morgan, “The Theory of the Gene,” *American Naturalist* 51 (1917): 513-54

*Jonathan Harwood, “The Reception of Morgan’s Chromosome Theory in Germany: Inter-War Debate over Cytoplasmic Inheritance,” *Medizinhistorisches Journal* 19 (1984): 3-32 (Translations of German passages follow in the reader.)

2/27: Heredity and Culture Beyond the Lab: Social Darwinism and Eugenics

****DRAFT of UNIT I Essay DUE IN CLASS**** (bring in 3 copies; essays to be exchanged in class)

Bowler, 152-173

3/1: Undergraduate WORKSHOP on Unit I papers (Graduate Students don't meet)

UNIT II: The New Biologies (Evolutionary and Molecular), 1935-1966

3/6: ****UNIT I ESSAYS DUE IN CLASS****

Round-Table Discussion of Unit I Exam Questions; Introduction to Unit II

3/8: Population Thinking, Fly Genetics, Population Genetics

Bowler, *Non-Darwinian Rev.*, pp. 107-113, 125-130

*Mark B. Adams, "Sergei Chetverikov, the Kol'tsov Institute, and the Evolutionary Synthesis," pp. 242-278 in Ernst Mayr and William Provine, *The Evolutionary Synthesis: Perspectives on the Unification of Biology* (reprint edition, Harvard U. Press, 1998)

Kohler, *Lords*, pp. 250-293

SPRING BREAK 3/10-3/18 (Begin E.O. Wilson, *Naturalist*, for fun—we'll start seriously at p. 138 later on.)

3/20: The Evolutionary Synthesis: What did it synthesize?

Mayr, *One Long Argument*, pp. 132-140; review pp. 32-47

*David J. Depew and Bruce J. Weber, pp. 299-303 in *Darwinism Evolving: Systems Dynamics and the Genealogy of Natural Selection* (MIT Press, 1995)

*Magnus, "Theory, Practice, and Epistemology," pp. 533-545 (Parts V-IX) (filed earlier in reader)

*Mayr, Ch. 5, "The Systematic Categories and the New Species Concept," pp. 102-122 in idem, *Systematics and the Origin of Species* (Columbia Univ. Pr., 1942).

[E. O. Wilson, *Naturalist*, pp. 99-123]

3/22: The Synthesis, Cold-War Liberalism, and Scientific Internationalism

*Theodozios Dobzhansky, Chapter 9: "Polymorphism, Class, and Caste" pp. 230-265 in idem, *Mankind Evolving: The Evolution of the Human Species* (NY: Bantam Books, 1962)

*Donna Haraway, Chapter 8: "Remodeling the Human Way of Life: Sherwood Washburn and the New Physical Anthropology" (selection), pp. 197-217 in idem, *Primate Visions: Gender, Race, and Nature in the World of Modern Science* (NY: Routledge, 1989)

3/27: Physics, Phage, and Molecular Biology in Postwar England and America

*Evelyn Fox Keller, "Physics and the Emergence of Molecular Biology: A History of Cognitive and Political Synergy," *J. Hist. Biol.*, 23 (1990): 389-410

James D. Watson, *The Double Helix* (Chapters 1 - 15)

3/29: Watson's *Double Helix*: The Reconstruction of the Past and the Construction of History
Watson, *The Double Helix* (Ch. 16 - end)

Reviews by Sinsheimer, Lear, Waddington, and letters by Perutz, Wilkins, and Watson, 191-198, 204-212, in James D. Watson, *The Double Helix*, ed. Gunther Stent. (Norton Critical Edition, 1980)

*John Ziman, "The Quest of the Golden Helix," pp. 15-21 in Ziman, *Puzzles, Problems, and Enigmas* (NY: Cambridge U. Pr. 1981)

*Erwin Chargaff, "A Quick Climb Up Mount Olympus," *Science*, vol. 159, 29 March 1968: 1448-1449

Sunday, 4/1 (or other date TBA): Screening and discussion of film, *The Race to the Double Helix*

4/3: Information as an Organizing Concept in the Postwar Period: The Genetic Code, 1952-1966

*Lily E. Kay, *Who Wrote the Book of Life?* 1-5, 7-30 [notes: 336-341]

*Michel Morange, *A History of Molecular Biology*, 120-162 [notes: 285-296]

(Undergraduates receive Unit II essay questions)

4/5: Naturalists in a Molecular World

E. O. Wilson, *Naturalist*, pp. 138-235, **esp. pp. 218-235**

*T. Dobzhansky, "Are Naturalists Old-Fashioned?" *American Naturalist* 100 (1966), 541-550

4/10: Draft of Unit II Essays due (3 copies); [breakfast-time screening of *Double Helix*? 8:45-11]

4/12: Unit II Workshop

Grad student discussion of Lily E. Kay, *Who Wrote the Book of Life?*

Unit III: Systems, Hierarchies, and the Ethos of Intervention: Biology as an Engineering Science

4/17: Ecology as Cold War Science: Radiation and Systems Biology

Unit II Take-home Essays Due in Class

*Joel Hagen, *An Entangled Bank: The Origins of Ecosystem Ecology*, pp.100-145

4/19: Evolutionary Ecology

*Sharon E. Kingsland, Chapter 8, "The Eclipse of History," pp. 176-205 in idem, *Modeling Nature: Episodes in the History of Population Ecology* (Chicago: Univ. of Chicago Press, 1985)

Wilson, *Naturalist*, pp. 238-281

4/24: Wilson and the "New Synthesis" of Sociobiology

Wilson, *Naturalist*, pp. 282-329

*Wilson, *Sociobiology: The New Synthesis* (Cambridge: Belknap/Harvard, 1975), Chapter 1, "The Morality of the Gene" (pp. 3-6); Ch. 14: "Roles and Castes" (selections: pp. 298-313, 554-555).

4/26: The Sociobiology Debate(s)

*Stephen Jay Gould, "Biological Potential vs. Biological Determinism" from *Natural History Magazine* (May 1986), reprinted as pp. 343-351 in Arthur L. Caplan, ed., *The Sociobiology Debate: Readings on the Ethical and Scientific Issues Concerning Sociobiology* (NY: Harper and Row, 1978)

*Richard Lewontin, Steven Rose, and Leon J. Kamin, Chapter 9, "Sociobiology: The Total Synthesis" pp. 233-264 in idem, *Not in Our Genes: Biology, Ideology, and Human Nature* (NY: Pantheon, 1984)

Wilson, *Naturalist*, pp. 330-353