

HIST SCI / MED HIST / HIST 132: Bees, Trees, Germs and Genes: A History of Biology (1700s-now)

University of Wisconsin-Madison

Credits: 3

Mode of Instruction: Online, Asynchronous

Semester: Summer 2023, 6 weeks, July 3- August 13

Canvas: <https://canvas.wisc.edu/courses/356319>

Instructor: Patrick M. Walsh (he/him/his)

Contact: pwalsh3@wisc.edu



(Jemmy Button by Jennifer Uman & Valerio Vidali)

Course description:

This survey course offers an introduction to the history of biology, from the late eighteenth century (1700s) to the present moment. There are many ways to approach the history of biology, but this course will emphasize the role of **people, power and place** in shaping the rise of the modern life sciences. This wider social and cultural context will let us see beyond standard narratives of scientific progress, which tend to reify Europe and America as the birthplace of science, and elite institutions (and people) as the primary producers of biological knowledge. Instead, we'll ask: Who made biological knowledge, and at whose expense was it made? Where

did biology take place, and what imperial, global and international networks made it possible? What does power have to do with this story, and how does it complicate our notion of science as a force for good in the world?

Moving chronologically, we will explore how the biological sciences came to exist through European conquest, colonialism and shifting ideological paradigms about what constitutes “life.” By the end of the course, we will see that the study of biology can be at once violent and emancipatory, exclusive and inclusive, racist and anti-racist, frightening and hopeful. While we are learning about biology’s past, I challenge you to think critically about our biological present: who benefits most from the production of biological knowledge, and who is harmed by it? Do the biological sciences have to work this way? How can the history of biology make us better thinkers, better scientists, and better global citizens in 2022?

Learning Outcomes: In successfully completing this course, students will be able to...

- Identify key people, places and events in the history of modern biology
- Make connections between the production of biological knowledge and wider networks of people (local, imperial, global, international)
- “People” the history of biology: that is, explain how biology emerged through the efforts of more than just elite scientific men
- Discuss the significance of race, gender and empire in the development of biological theories
- Decenter sites of higher learning in Europe and America—laboratories and universities—and understand the stakes of this project

Assessment Outcomes: In successfully completing all course assessments, students will be able to...

- Identify broad changes over time in the development of biological ideas
- Build original historical connections within and across specific subject groupings: empires of biology; natural history; evolution; microscopic life; and genetics
- Identify broad examples of continuity and discontinuity in the history of biology
- Write analytically and persuasively about the history of biological ideas

Sources:

Most assigned readings are secondary sources. Students will develop competency in distilling arguments made by historians and drawing novel connections between multiple authors. There are some primary sources assigned. Before grappling with these readings, students will be introduced to the distinction between primary and secondary sources.

A Note on Syllabus Structure:

This course is divided into 3 chronological units. “Chronological” means that we begin at a set point in the past (for us, the late eighteenth century) and then we gradually and carefully step through to a set point in time closer to our present moment (for us, the twenty-first century).

Historians use chronology to think about what changes over time and reasons for this change (causation).

How Credits are Met:

45 Hours Per Credit – One credit is the learning that takes place in at least 45 hours of learning activities, which include time listening to lectures/podcasts/videos, completing readings, doing course assessment (reading responses, quizzes and capstone assignments) and meeting with the instructor. Given that this is a 3-credit course, you can expect to spend a total of 135 hours working on course activities throughout the 6-week summer session.

Course Assessment:

Reading Responses (20%):

- 18 x reading responses (see **Workflow** document). Each reading response should be approximately 250 words in length (no longer). Prompts will appear on Canvas.
- Deadlines: All reading responses must be completed by the end of the week in which they were assigned. **“End of week” means Sunday, 11:59pm.** All reading responses submitted after this deadline will be graded “incomplete,” unless a prior arrangement is made with the instructor.
- Grading: Reading responses will be graded on a score of 0-1. 0 = incomplete. 0.5 = needs improvement (feedback will be provided by instructor). 1 = complete.
- What constitutes a good reading response? Prose (not bullet-points) that provides evidence that one has done the readings, that one has listened to course video material, and that exhibits a sincere attempt to answer all parts of the prompt. I have also uploaded a rubric for each reading response with more details on what constitutes a “complete” submission.

Weekly Quizzes (15%): There will be a quiz each week (including Week 1!) composed of 10 questions that are a mix of multiple choice and short answer. Quizzes can be taken at any time on Canvas during the week. You will have 2 attempts. Only your best score will be recorded. **Quiz portals close at 11:59pm on Sunday each week.** Quiz questions are formulated from lecture material and weekly readings.

Capstones (3 x 20%): Capstone assignments are due at the end of each unit (**Sunday, 11:59pm in Weeks 2, 4 and 6**). Capstone assignments are designed to facilitate historical thinking within and across specific subject groupings: Empires of Biology; Natural History; Evolution; Microscopic Life; Genetics. Each Capstone assignment will build a specific set of skills.

Assignment Planning with Instructor (5%): You are required to meet with the instructor before each capstone assignment is due to discuss your essay plans. Meetings are by appointment and will take place over Zoom. This course requirement is designed to promote communication between student and instructor, to allow for assignment planning and feedback, and to ensure that students comprehend critical course concepts.

Grading Scale

Grading: All assignments will receive a numeric score (e.g. 9/10, 29/30); your final composite numerical grade (weighted according to the percentages above) will be converted into a final letter grade using the conversion table below.

Percentage	<60	60-68.9	69-74.9	75-80.9	81-86.9	87-92.9	93 and above
Grade	F	D	C	BC	B	AB	A

Course Policies:

Email: For short questions (e.g. assignment due dates), please review the syllabus and course summary first. If the answer is not there, you may post on the Q&A forum on the Canvas website, and I will reply there within 24 hours. For longer questions (e.g. advice on how to approach an assignment), drop into my office hours. For more specific and/or personal concerns, feel free to set up a time to meet with me virtually. I monitor my inbox multiple times a day throughout the working week (M-F, 9-5) and you can expect a swift response from me if you email during these times. Note, however, that I do not respond to emails late at night or on weekends.

Late assignments: If you are facing circumstances that are making it difficult for you to meet assignment deadlines, I am happy to discuss deadline extensions or other accommodations. (You can also contact the Dean of Students Office for assistance with these issues: <https://doso.students.wisc.edu/student-assistance/>). Please come see me well in advance of the assignment deadline whenever possible. If you do not make arrangements with me more than 24 hours before the due date and time, late assignments will lose 5% of the total assignment points per 24 hours late. (The first 5% is docked between 0 and 24 hours.) Assignments will not be accepted more than 120 hours (5 days) after the due date and time.

Accommodation of Student Needs:

I am invested in your success in this course. I aim to ensure that the course is accessible and that students have the support they need. Please discuss any accommodations or accessibility needs with me as soon as possible. The sooner we can address issues, the more options we have to solve and head off problems. If unforeseen circumstances arise over the semester, please talk with me about how we can help support your success.

Resources:

McBurney Center for Disability Services: If you are interested in receiving university services

and accommodations for your disability, please contact McBurney by phone at 608-263-2741 or email at FrontDesk@mcb.wisc.edu.

History Lab and Writing Center: Both the History Lab and Writing Center offer a variety of useful resources, including tutoring sessions, handouts and writing classes. If you find that you need extra writing help for any of our assignments, I highly recommend you make appointments early to make sure you have enough time to integrate the feedback you receive. For information, visit <https://history.wisc.edu/undergraduate-program/the-history-lab/> or <http://www.writing.wisc.edu>.

University Health Services: If you could use some FREE help managing your time, dealing with stress, managing money, or pretty much anything else, UHS has got you covered: <https://www.uhs.wisc.edu/mental-health/lets-talk>.

Diversity & Inclusion Statement

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

Academic Integrity:

As stated on the University of Wisconsin-Madison's page on academic integrity (<https://conduct.students.wisc.edu/academic-integrity/>):

“Academic misconduct is governed by state law, UWS Chapter 14 (PDF). Misconduct includes the following, but is not limited to this list:

- Seeks to claim credit for the work or efforts of another without authorization or citation (plagiarism)
- Uses unauthorized materials or fabricated data in any academic exercise (using notes for a closed-book online exam)
- Forges or falsifies academic documents or records (having a friend sign you in for attendance when you're absent)
- Intentionally impedes or damages the academic work of others (tampering with another student's experiment)
- Engages in conduct aimed at making false representation of a student's academic performance (altering test answers and submitting the test for regrading)
- Assists other students in any of these acts.”

The University of Wisconsin-Madison takes academic misconduct allegations very seriously. If an instructor suspects a student has engaged in academic misconduct, then the instructor will

contact the student and ask him/her/them to explain their work. If the instructor still believes academic misconduct occurred after meeting with the student, he/she will determine the consequences, known as sanctions. One or multiple sanctions may be imposed.

Types of sanctions include an oral reprimand up to expulsion. If the sanction affects any grade, the student will then be notified in writing, typically by email, of the instructor's decision. The Office of Student Conduct & Community Standards (OSCCS) is also informed and will contact the student about his/her rights and any additional sanctions. Repeated acts of academic misconduct or extreme circumstances may result in more serious actions such as probation, suspension, or expulsion."

If you have concerns or confusion around academic integrity, please discuss them with me. The Writing Center can also help you with general citation rules.

A Note on ChatGPT:

- I encourage students to thinking critically about the advantages and risks of using generative AI in educational settings
- ChatGPT will be incorporated in many class assignments, as indicated
- Students may, of course, consult ChatGPT about class material as they might Wikipedia, in full knowledge that ChatGPT (like Wikipedia) is not a citable authority
- Students may not pass up text generated by AI as their own writing
- Submitting AI-generated text for class assignments is plagiarism

Privacy of Student Records & the Use of Audio Recorded Lectures Statement

View [more information about FERPA](#).

"Lecture materials and recordings for this course are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability who has an approved accommodation that includes recording. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities, with the exception of sharing copies of your personal notes as a notetaker through the McBurney Disability Resource Center. Students are otherwise prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct."

COURSE PLANNER

Week	Monday	Tuesday	Wednesday	Sunday
1	NATURAL HISTORY	SCIENCE AS EMPIRE	SCIENTIFIC LANGUAGE	DUE: QUIZ DUE: RR X 3
2	NATURAL HISTORY	EVOLUTION	EVOLUTION	DUE: QUIZ DUE: RR X 3 DUE: CAPSTONE 1
3	MICROBIOLOGY	MICROBIOLOGY	MICROBIOLOGY	DUE: QUIZ DUE: RR X 3
4	EUGENICS	HEREDITY	GENETIC MEDICINE	DUE: QUIZ DUE: RR X 3 DUE: CAPSTONE 2
5	GENETICS	GENETICS	GENOMICS	DUE: QUIZ DUE: RR X 3
6	EPIGENETICS	POSTGENOMICS	SCIENCE AS EMPIRE	DUE: QUIZ DUE: RR X 3 DUE: CAPSTONE 3

Unit 1: Collecting, Classifying, and Ordering Nature (Linnaeus to Darwin)

Timeline: late eighteenth century (1700s) to late nineteenth century (1800s)

Unit 1 Learning Objectives:

This unit introduces key themes in nineteenth-century biology through the lens of empire, gender and race. It broadly charts histories of bioprospecting, taxonomizing and evolutionary theory. Specifically, it aims to show how:

- Biological discovery depended on imperial voyaging, infrastructure and language
- Biologists, in their attempt to classify and order, produced hierarchies of people and Nature
- Darwin's evolutionary theory was built with sexist and racist assumptions
- The controversial reception of Darwin's theory of human evolution

Week 1: Monday: Course Introductions & Natural History (BEGINS 07/03/23)

Required Readings:

1. Sam Kean, "Science's Debt to the Slave Trade: Historians Confront the Tainted Origins of Key Plant and Animal Collections," *Science* 364, no. 6435 (2019, April 5): 16-20.
2. London Schiebinger, Ch. 1, "Voyaging Out," 23-46, in *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge, MA & London, England: Harvard University Press, 2004).

Week 1: Tuesday: Science as Empire

Required Readings:

1. Janet Browne, "Biogeography and Empire," Ch. 18, 305-321, in *Cultures of Natural History*, edited by Jardine, N., J. A. Secord, and E. C. Spary (Cambridge; New York: Cambridge University Press, 1996).

Week 1: Wednesday: Scientific Language

Required Readings:

1. London Schiebinger, "Linguistic Imperialism," Ch. 5, 194-225, in *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge, MA & London, England: Harvard University Press, 2004).

Week 2: Monday: Natural History (BEGINS 07/10/23)

Required Reading:

1. Clifton Crais & Pamela Scully, "Paris, City of Light," Ch. 6, 116-141, in *Sara Baartman and the Hottentot Venus: A Ghost Story and a Biography* (Princeton, N.J.: Princeton University Press, 2009).

Week 2: Tuesday: Evolution (Origin)

Required Reading:

1. Darwin, *On the Origin of Species*, 1859, "Introduction" + "Conclusion," pp. 1-6 + pp. 480-490 (pp. 9-12 and 251-256 of PDF)
2. Edward J. Larson, "On the Origins of Darwinism," chap. 3 in *Evolution: The Remarkable History of a Scientific Theory* (New York: Modern Library, 2006)

Week 2: Wednesday: Evolution (Descent)

Required Readings:

1. Darwin, *The Descent of Man*, 1871, “Conclusion,” pp. 385-405 (pp. 402-513 of PDF)
2. Evelleen Richards, “The Ugly Brother,” chap 1. in *Darwin and the Making of Sexual Selection* (Chicago and London: The University of Chicago Press, 2017), 3-34.

Unit Capstone 1: (Essay, 1000 words)

Prompt will be released on Canvas. **Due Date: Sunday, July 16 @ 11:59pm on Canvas.**

Unit 2: Striving for Supremacy (Bacteriology-DNA)

Timeline: late nineteenth century (1890s) to post-WWII (1950s)

Unit 2 Learning Objectives:

In Unit 1 we saw how nineteenth-century biologists classified and ordered people and Nature. In Unit 2, we will see how biological imperialism continued into the early twentieth century, although arguably with a different tone. There was a concerted effort to control, manage and direct the futures of living organisms and ecosystems. Specifically, this unit will:

- Show how cell theory and germ theory generated unresolved questions about individuality, the species concept and relationships between organisms
- Reveal the power and politics of laboratories, microbes and sanitary campaigns
- Explore the rise of eugenics
- Track the fate of evolutionary theory after Darwin and its appropriation by early twentieth-century biologists and human scientists

Week 3: Monday: Microbiology (BEGINS 07/17/23)

Required Reading:

1. Laura Otis, “Virchow and Koch: The Cell and the Self in the Age of Miasmas and Microbes,” in *Membranes: Metaphors of Invasion in Nineteenth-Century Literature, Science, and Politics* (Baltimore: Johns Hopkins University Press, 1999), pp. 8-36.

Week 3: Tuesday: Microbiology

Required Reading:

1. Nancy Tomes, “Apostles of Germ Theory,” chap. 1 in *Gospel of Germs: Men, Women, and the Microbe in American Life* (Harvard University Press, 1998).

Week 3: Wednesday: Microbiology

Required Reading:

1. E. Richard Brown, "A Public Health in Imperialism: Early Rockefeller Programs at Home and Abroad," *American Journal of Public Health* 66, no. 9 (1976): 897-903.

Week 4: Monday: Eugenics (BEGINS 07/24/23)

Required Readings:

1. Diane B. Paul, "What is Eugenics? Why Does it Matter?" chap. 1 in *Controlling Human Heredity: 1865 to the Present* (Humanity Books, 1995), pp. 1-21.
2. Diane B. Paul, "Evolutionary Anxieties," chap. 2 in *Controlling Human Heredity: 1865 to the Present* (Humanity Books, 1995), 22-39.

Week 4: Tuesday: Heredity

Required Readings:

1. Diane B. Paul, "From Soft to Hard Heredity," chap. 3 in *Controlling Human Heredity: 1865 to the Present* (Humanity Books, 1995), pp. 40-49
2. Diane B. Paul, "The Menace of the Moron," chap. 4 in *Controlling Human Heredity: 1865 to the Present* (Humanity Books, 1995), pp. 50-71.

Week 4: Wednesday: Genetic Medicine

Required Readings:

1. Nathaniel Comfort, "Hereditary Clinics," chap. 4 in *The Science of Human Perfection: How Genes Became the Heart of American Medicine* (New Haven & London: Yale University Press, 2012), pp. 97-129.

Unit Capstone 2: (Essay, 1000 words)

Prompt will be released on Canvas. **Due Date: Sunday, July 30 @ 11:59pm on Canvas.**

Unit 3: DNA to Genomics

Timeline: Postwar period (1950s) to the early twenty-first century (2000s-now)

Unit 3 Learning Objectives:

Unit 1 showed the attempt of naturalists to classify and order Nature, and Unit 2 explored biologists' impulse to manage and control living systems, including human reproduction. Unit 3 pushes into the postwar era, where molecular biologists found the means to investigate and then manipulate the code of life itself. Yet, while DNA was once described by late twentieth-century scientists as a “master molecule,” twenty-first-century scientists have become far less sure of its merits as the organizing unit of biology. This unit explores the rise and fall of the “gene” concept as the central dogma of biology and culture. Specifically, this final unit will:

- Introduce students to the era when DNA was considered the “master molecule of life”
- Complicate the DNA dogma by showing critiques of genetic determinism
- Explore new fields in genetic and genomic research, including epigenetics and CRISPR
- Explore how imperial legacies endure through genomic science, germline editing and data-driven approaches to the life science

Week 5: Monday: Genetics (Master Molecule) (BEGINS 07/31/23)

Required Readings:

1. Jan Sapp, “Conceiving a Master Molecule,” chap. 16 in *Genesis: The Evolution of Biology* (Oxford & New York: Oxford University Press, 2003)
2. James Watson & Francis Crick, “Molecular Structure of Nucleic Acids,” *Nature* no. 4356 (April 25, 1953): 737-738.

Week 5: Tuesday: Genetics (Determinism)

Required Readings:

1. Dorothy Nelkin and M. Susan Lindee, “Sacred DNA,” chap. 3 in *The DNA Mystique: The Gene as a Cultural Icon* (University of Michigan Press, 2004), pp. 38-57.
2. Dorothy Nelkin and M. Susan Lindee, “Creating Natural Distinctions,” chap. 6 in *The DNA Mystique: The Gene as a Cultural Icon* (University of Michigan Press, 2004), pp. 102-126.

Week 5: Wednesday: Genomics

Required Readings:

1. Sarah Zhang, “The Last Children of Downs Syndrome,” *The Atlantic*, December 2020.

Week 6: Monday: Epigenetics (BEGINS 08/17/23)

Required Readings:

1. Michel Morange, “Epigenetics,” chap. 26 in *The Black Box of Biology* (Harvard University Press, 2020), 325-339.

Week 6: Tuesday: Postgenomics

1. Hallam Stevens and Saras S. Richardson, “Beyond the Genome,” chap. 1 in *Postgenomics: Perspectives on Biology after the Genome* (Duke University Press, 2015), 1-8.
2. Evelyn Fox Keller, “The Postgenomic Genome,” chap. 2 in *Postgenomics: Perspectives on Biology after the Genome* (Duke University Press, 2015), 9-3.

Week 6: Wednesday: Science as Empire

Required Readings:

1. Kim TallBear, “Genomic Articulations of Indigeneity,” *Social Studies of Science* 43, no. 4 (2013): 509-533.

Unit Capstone 3: (Essay, 1000 words).

Prompt will be released on Canvas. **Due Date: Sunday, August 13 @ 11:59pm on Canvas.**