

History of the Life Sciences in the Twentieth Century

HISC 108

This class explores the history of the life sciences over the course of the last century, with an emphasis on model organisms and how they shape research. The great puzzles of evolution, heredity, and development were posed in the nineteenth century, by naturalists working with a series of plants and animals including passionflowers, barnacles, pigeons and peas. The century just past delved deeper into the mechanisms of these processes using new model organisms. In the first few decades of the twentieth century, fruit flies were captured and bred to unlock the mechanisms of chromosomal inheritance, while various experiments were conducted on that most intractable of organisms, *Homo sapiens*. After the Second World War, researchers from the physical sciences seized on tools like bacteriophage, which seemed to straddle the organic and inorganic worlds. Other organisms such as mice and zebrafish leant themselves to the standardization, replication and circulation demanded by global scientific co-operation and competition. By the century's end, laboratory animals could be genetically engineered to answer specific research questions. This course will explore how our experimental engagement with the non-human world has begun to unlock the secrets of life, opening up unprecedented manipulative and predictive powers for our endlessly inquisitive species.

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Course Requirements:

Lectures are twice a week. You are required to attend. I will occasionally hand round a sign in sheet. Two or more unexcused absences may result in the diminution of your final grade.

No electronic media is permitted in lecture: the lecture notes and power point slides will be available on WebCt.

There will be a take-home mid-term, due in lecture on the Tuesday of fifth week (40%), and a take home final essay, due in lecture on the Tuesday of tenth week (60%).

*You are expected to write your papers by yourself, using your own words and ideas or otherwise attributing them to the writer from whom you borrowed. Please use APA standards for proper citation and attribution, the rules of which are to be found on WebCt. In order to get credit for your work, you are required to submit an electronic copy to turnitin.com by midnight of the due date. **Any copying or paraphrasing of another's words or ideas without citation is plagiarism and a violation of the UCSD standards of academic integrity.***

HISC 108 READING

FIRST WEEK

Darwin's Pigeons: the mystery of species

Charles Darwin, 1859, *The Origin of Species by Means of Natural Selection or the Preservation of Favored Races in the Struggle for Life* (many editions) Ch. 1. 'Variation Under Domestication.'

*Jim Secord, 1981, 'Nature's Fancy: Charles Darwin and the Breeding of Pigeons,' *Isis* 72: 163-186

SECOND WEEK

Mendel's peas: the mathematics of heredity

Gregor Mendel, 1865, 'Experiments in Plant Hybridization,' trans. William Bateson, in *Classic Papers in Genetics*, ed. James A. Peters, Prentice Hall, Inc., 1959, pp. 1-19.

*Jan Sapp, 1990, 'The Nine Lives of Gregor Mendel' in *Experimental Inquiries*, edited by H. E. Le Grand, Kluwer Academic Publishers, pp. 137-166.

THIRD WEEK

Fruit flies: the beginnings of chromosome mapping

T. H. Morgan, 1910, 'Sex Limited Inheritance in *Drosophila*' in *Classic Papers in Genetics*, ed. James A. Peters, Prentice Hall, Inc., 1959, pp. 63-66.

A. H. Sturtevant, 1913, 'The Linear Arrangement of Six Sex-Linked Factors in *Drosophila*, as Shown by their Mode of Association' in *Classic Papers in Genetics*, ed. James A. Peters, Prentice Hall, Inc., 1959, pp. 67-77.

*Robert Kohler, 1993, '*Drosophila*: a Life in the Laboratory' *Journal of the History of Biology*, 26:281-310

FOURTH WEEK

Drosophila pseudoobscura: wild populations and the evolutionary synthesis

Theodosius Dobzhansky, 1951, 1st ed. 1937, *Genetics and the Origin of Species*. 3rd Edition. New York: Columbia University Press, chapter 1 (“Organic diversity”), and excerpts from chapter 3 (“Mutation in population”).

* Robert E. Kohler, 1994, *Lords of the Fly: Drosophila Genetics and the Experimental Life*. Chicago: University of Chicago Press, pp. 250-293.

FIFTH WEEK

Homo Sapiens: the impossible species

Paul Popenoe and Roswell Hill Johnson, 1920, *Applied Eugenics*, New York: The Macmillan Co., chapter X, “Methods of Restriction,” pp. 184-210.

Genetics Conference, Committee on Atomic Casualties, National Research Council, 1947, *Genetic Effects of the Atomic Bombs In Hiroshima and Nagasaki in Classic Papers in Genetics*, ed. James A. Peters, Prentice Hall, Inc., 1959, pp. 194-199.

*Phillip Pauly, 2000, *Biologists and the Promise of American Life*, Princeton, Princeton University Press, pp. 214-238.

SIXTH WEEK

Bacteriophage: the physics of life

Max Delbrück, 1949, *A Physicist looks at Biology* text of a lecture given in 1949, many editions.

Watson, James and Francis Crick, 1953, *Molecular Structure of Nucleic Acids in Classic Papers in Genetics*, ed. James A. Peters, Prentice Hall, Inc., 1959, 241-243.

*Evelyn Fox Keller, 1990, “Physics and the Emergence of Molecular Biology.” *Journal of the History of Biology* 23: 389-409.

*Lily E. Kay, 1985, “Conceptual Models and Analytical Tools: the biology of physicist Max Delbrück,” *Journal of the History of Biology* 18:2, pp. 207-246

SEVENTH WEEK

Maize: the puzzles of development

Barbara McClintock 1983, *Nobel Lecture*

*Evelyn Fox-Keller, 1982, *A Feeling for the Organism* New York: W. H. Freeman and Co. Chs. 8 and 9, pp. 121-151

*Nathaniel Comfort, 1999, 'The real point is control': *The reception of Barbara McClintock's controlling elements*, *Journal of the History of Biology* 32:133-62

EIGHTH WEEK

Sea Slugs: the biology of behavior

Kandel, Eric, 2001, 'The Molecular Biology of Memory Storage: a Dialog Between Genes and Synapses' *Science*

Kandel, Eric, 2006, *In Search of Memory*, New York: Norton, pp. 3-11, 117-149

NINTH WEEK

Mice: supermodels!

*Ilana Löwy and Jean-Paul Gaudillière, 1998, 'Disciplining cancer: mice and the practice of genetic purity', in Jean-Paul Gaudillière and Ilana Löwy (eds), *The Invisible Industrialist: Manufactures and the Production of Scientific Knowledge*, Basingstoke: Macmillan, pp. 209-49.

Jennifer Cropley et. Al., 2008, 'Germline epigenetic modification of the murine Avy allele by nutritional supplementation,' *Proceedings of the National Academy of Sciences* 103: 1708-1712

Shirley Tilghman (1999) 'The Sins of the Fathers and Mothers: Genomic Imprinting in Mammalian Development' *Cell*, 96:185-93

**Leslie A Pray, 2004, 'Epigenetics: genome, meet your environment' *The Scientist* July 5th 2004

TENTH WEEK

The Human Genome: race, genealogy, and ancestry

Genographic project, ethics statement