# 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 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 century, 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 fruit flies 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.*

*The reading for each week should be done by the time of Tuesday's lecture. Each lecture will have a discussion period, in preparation for which you might be asked to write down your thoughts. Please come prepared to participate!*

*There are two possible tracks for written work:*

*The first track involves a midterm exam (40%), and a take-home final (60%), and will not require attendance at discussion sections.*

*The second track is for those who wish to address questions about the writing of history of science, under the guidance of the TA Elena Aronova, and will involve writing four reading responses (40%), instead of the mid-term, and the option of writing a research paper instead of the final (60%).*

## HISC 108 READING

FIRST WEEK

**Darwin and the puzzle of species** (55 pages)

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.' (30 pages)

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

SECOND WEEK

**Mendel's peas and the beginnings of the century of the gene** (80 pages)

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.

Hugo De Vries, 1905, 'New Species of Oenothera' in *Species and Varieties: their origins by mutation* New York: Open Court Publishing Company, pp. 516-546.

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

THIRD WEEK

**Fruit Flies: from mutations to chromosome maps** (45 pages)

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

**Guinea pigs: experimental evolution and the evolutionary synthesis** (65 pages)

Sewall Wright, 1917, *Color Inheritance in Mammals* in *Classic Papers in Genetics*, ed. James A. Peters, Prentice Hall, Inc., 1959, 78-91.

L. C. Dunn, 1921, *Unit Character Variation in Rodents* in *Classic Papers in Genetics*, ed. James A. Peters, Prentice Hall, Inc., 1959, 92-104.

*Betty Smocovitis, 1996, *Unifying Biology*, Princeton: Princeton University Press, pp. 114-153.

FIFTH WEEK

**Homo Sapiens: the impossible species** (45 pages)

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.

Herman J. Muller (1963) 'Genetic progress by voluntarily conducted germinal choice' in *Man and His Future* New York: Little Brown, pp. 247-262.

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

SIXTH WEEK

**Bacteriophage: the physics of life** (80 pages)

Erwin Schrödinger, 1944, *What is Life?,* pp. 1-32.

Watson, James and Francis Crick *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 (1993) *The Molecular Vision of Life: Caltech, the Rockefeller Foundation, and the Rise of the New Biology.* Oxford: Oxford University Press, 1993. Suggested pages: 39-50; 132-136; 243-264

SEVENTH WEEK

**Maize: a complex organism and the puzzles of development** (70 pages)

Barbara McClintock 1950, *The Origin and Behavior of Mutable Loci in Maize* in *Classic Papers in Genetics*, ed. James A. Peters, Prentice Hall, Inc., 1959, pp. 199-208

*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

**Zebrafish: the new kid on the block** (70 pages)

Michael J. Parsons et.al. (2002) 'Removal of dystroglycan causes severe muscular dystrophy in zebrafish embryos' *Development* 129:3505-3512, pp. 3510-11

Robert Gerlai et. al., 2000, 'Drinks like a fish: zebrafish (danio rerio) as a behavior genetic model for studying alcohol effects' *Pharmacology, Biochemistry and Behavior* 67:773-782

(*)D. J. Grunwald and J. S. Eisen, 2002, *Headwaters of the Zebrafish: the emergence of a new model vertebrate* Nature Review Genetics, 3:717-724

*Rachel Ankeny, 2006, 'Wormy Logic: model organisms as case-based reasoning' *How Well do Facts Travel*, London: London School of Economics.

NINTH WEEK

**Mice: supermodels!** (50 pages)

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

*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.

TENTH WEEK

**More mice and some aphids…** (45 pages)

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

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

*Daniel Alexandrov and Elena Aronova (2004) 'Russian Theoretical Biology between Heresy and Orthodoxy: Georgii Shaposhinikoff and his Experiments on Plant Lice' in Abigail Lustig, Robert J. Richards, and Michael Ruse, (eds.) *Darwinian Heresies*, Cambridge: Cambridge University Press, pp. 14-48.