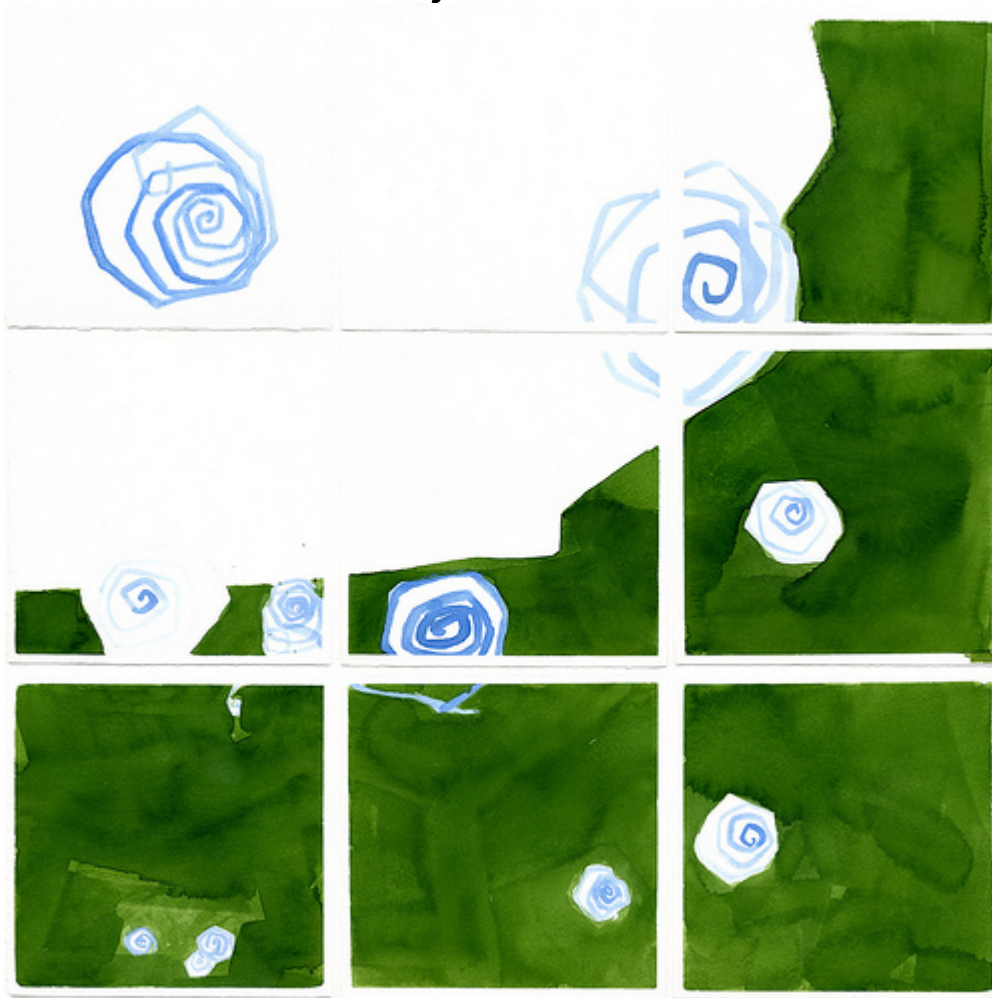


Department of History of Science  
Faculty of Arts & Sciences  
Harvard University

History of Science 133  
Fall term 2010

# Biotechnology in Society

## Syllabus



Genomic art: high-throughput drawing  
Artist: Daniel Kohn

Harvard University  
Department of History of Science

History of Science 133  
***Biotechnology and society***

## **Teaching Staff**

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Office Hours: 11am-12pm Monday and Wednesday, and by appointment.

## **Subject Description**

This subject will introduce students to selected research and commercial applications of modern biotechnology in order to discuss the broader social, ethical, risk, and regulatory issues that arise from them. A range of topics will be covered in this subject, including genetic engineering, cloning, stem cell research, xenotransplantation, the production of pharmaceuticals, the human genome project, genetic testing, assisted reproductive technologies, and synthetic biology. Students will consider debates that have taken place in the wider community about ownership, commercialisation, identity, governance, animal welfare, human well-being, and expertise in relation to these applications of modern biotechnology.

## **Attendance Requirements**

Students are expected to attend two lectures each week:

**Monday, 10-11am, Science Center 469**

**Wednesday, 10-11am, Science Center 469**

Students must also attend a weekly one-hour section (time TBC).

Sections begin in Week 2 and run through to Week 14. You are required to attend at least eight of these sections unless you have a very good reason for your absence (e.g. illness or other difficulties), in which case an exemption from penalty will be granted. Failure to attend the required eight sections without

receiving an exemption from penalty will result in a grade penalty of 20% (i.e. the full section participation component).

## Website

The website (<http://isites.harvard.edu/k74116>) is an important source of information for this subject. Useful resources such as this subject guide, links to further readings, details of assessment, and subject announcements will be available through this website. Check the website regularly for subject announcements and updates.

## Readings

All required readings for this subject are included in the subject reading pack, which is available for purchase at Gnomon Copy in Harvard Square. PDFs of these required readings are also available on the course website.

Required readings represent the minimum expected for you to participate effectively in class.

Further recommended readings are listed on the website. These references are intended as an additional guide for research and resources for assignments. Where possible, these have been placed on reserve in the library.

## Assessment Structure

Midterm exam (in class, Wednesday October 13) – 20%  
Research essay (12-15 pages) – 30%  
Take-home final exam – 30%  
Section participation – 20%

## Assessment Policies and Guidelines

Late papers exams will lose marks at the rate of **one third of a letter grade per day** (including weekends).

Note that extensions will only be granted in very special cases.

Paper writing guidelines are also available on the website. If you require further support in developing your research and essay writing skills, it is recommended you consider the resources and services available through the Writing Center.

Ensure that you follow appropriate citation conventions for all assignments and familiarize yourself with the University's policies on plagiarism and collaboration.

## **Midterm exam**

The midterm exam will be held in class on Wednesday October 13. It will require two short essay responses based on questions relating to the themes of the course.

## **Research Paper**

Each student is required to write a 12-15 page research essay.

Suggestions for possible paper topics are given on the website. You are encouraged to devise your own paper topic in consultation with the lecturer.

As part of the writing process, you will be required to hand in a draft of your paper. This will be graded pass/fail and be worth one-third of the overall grade for the paper (ie. 10% of the overall class grade). There will also be a brief topic statement due early in the semester.

**A draft of the essay will be due: Wednesday November 10<sup>th</sup>, 5pm.  
Final versions will be due: Friday December 3<sup>rd</sup>, 5pm.**

## **Take-home final examination**

The take-home final exam will take place during reading period. It will be made available at **noon on Wednesday December 8th and will be due 48 hours later at noon on Friday December 10<sup>th</sup>**. You are encouraged to work on the exam for no longer than three hours. Exams consisting of more than eight double-spaced pages of typed text (12 point font) will not be accepted.

The exam will consist of two essay questions which will ask you to critically reflect on the themes of the course. You may refer to the lecture slides, the course readings, and any notes you took during the semester during the exam. Collaboration is strictly forbidden.

## **Section Participation**

Section attendance and participation comprises a significant proportion of the final grade for the class (20%).

## **Lecture Schedule**

### **Week 1: Introduction**

Lecture 1 (September 1): Beer and the history of biotechnology

### **Labor Day (September 6)**

### **Week 2: Introduction (continued)**

Lecture 2 (September 8): Introduction to the course: themes and methods

### **Week 3: Genetic engineering**

Lecture 3 (September 13): Genetic engineering: a brave new world?

Lecture 4 (September 15): The recombinant DNA debate in the US

### **Week 4: Owning life: patents and profits**

Lecture 5 (September 20): Biotechnology and business

Lecture 6 (September 22): Patenting life

### **Week 5: Genetically Modified Foods**

Lecture 7 (September 27): Risk, ethics, and gene technology

Lecture 8 (September 29): The economics of our food

Film Screening: *Food Inc.*(2008)

### **Week 6: Hybrids, crosses, and the boundaries of bodily life**

Lecture 9 (October 4): Banking and owning human cells

Lecture 10 (October 6): Xenotransplantation and life outside the body

### **Week 7:**

### **Columbus Day (October 11)**

### **Midterm exam (Wednesday October 13)**

### **Week 8: Mapping genes, making society**

Lecture 11 (October 16): Eugenics: lessons for medical genetics

Lecture 12 (October 18): The Human Genome Project

### **Week 9: Genetic testing, discrimination, and bioethics**

Lecture 13 (October 25): Genetic testing, disability, and discrimination

Lecture 14 (October 27): Bioethics and medicine

**Week 10: Virgin births**

Lecture 15 (November 1): Cloning

Lecture 16 (November 3): Stem cells and amoeboid life

**Week 11: Assisted reproductions**

Lecture 17 (November 8): From the Pill to IVF

Lecture 18 (November 10): Designer babies and the reproductive-industrial complex

**Week 12: Minding your own biological business**

Lecture 19 (November 15): Drugs and designer bodies

Lecture 20 (November 17): Personal genomics

**Week 13: Biotechnology and diversity**

Lecture 21 (November 22): Biotechnology and the politics of race

Lecture 22 (November 24): Bioprospecting and biocolonialism

**Week 14: Biological futures**

Lecture 23 (November 29): Synthetic biology, bioterrorism, and biosecurity

Lecture 24 (December 1): Eternal life and the post-human future

## Reading list:

### Weeks 1 and 2: Introduction

- Robert Bud (1992). "The zymotechnic roots of biotechnology" *British Journal of the History of Science* 25: 127-144.
- ChandakSengoopta, "'Dr Steinach coming to make old young!': sex glands, vasectomy and the quest for rejuvenation in the roaring twenties." *Endeavour* 27(3): 5.
- Rima Apple (2000). "Vitamins Win the War: Nutrition, Commerce, and Patriotism in the United States During the Second World War," 135-149 in David F. Smith and Jim Phillips eds., *Food, Science, Policy and Regulation in the Twentieth Century*, Routledge.

### Week 3: Genetic engineering

- Paul Berg (1974) (letter). "Potential biohazards of recombinant DNA molecules" *Science* (July 26): 303.
- Hans-Jörg Rheinberger (2000). "Beyond nature and culture: modes of reasoning in the age of molecular biology and medicine," in Margaret Lock, Alan Young and Alberto Cambrosio, eds., *Living and Working with the New Medical Technologies*, Cambridge University Press, pp. 19-30.
- Everett Mendelsohn (1984). "'Frankenstein at Harvard' The public politics of recombinant DNA research" in *Tradition and transformation in the sciences*, E. Mendelsohn, ed., pp. 317-335.

### Week 4: Owning and patenting life

- *Diamond v. Chakrabarty*, 447 U.S. 303.
- Daniel Kevles. (2002) "Of mice and money: the story of the world's first animal patent" *Daedalus*, 131(Spring): 78-88.
- Sally Smith Hughes (2001) "Making Dollars out of DNA: The First Major Patent in Biotechnology and the Commercialization of Molecular Biology, 1974-1980," *Isis* 92: 541-575.

### Week 5: Genetically modified food

- Code of Federal Regulations, Title 7 (Agriculture), Chapter 3 (Animal and Plant Health Inspection Service, Department of Agriculture), Section 340 (Introduction of organisms and products altered or produced through genetic engineering which are plant pests or which there is reason to believe are plant pests).
- “Monsanto vs. US Farmers” (2004). A report by the Center for Food Safety, Washington DC.
- Brian Wynne. (2003). “Interpreting public concerns about GMOs – Questions of meaning” in Celia Deane Drummond and Bronislaw Szerszynski, eds. *Reordering nature: theology, society, and the new genetics*, London and New York, T&T Clark, pp. 221-248.
- Rosemary Robins. (2006). “Gene technology and its citizen subjects” *Australian journal of emerging technologies and society* 4(1): 45-59.

#### **Week 6: Hybrids and crosses**

- Catherine Waldby. (2002). “Biomedicine, tissue transfer and intercorporeality” *Feminist theory* 3(3): 239-254.
- Paul Rabinow. (1996). “Severing the Ties: Fragmentation and Dignity in Late Modernity,” in *Essays on the Anthropology of Reason*, Princeton University Press, pp. 129-152.
- International Center for Technology Assessment. 2009. Brief for Amici Curiae in *Association for Molecular Pathology et al. v. Myriad Genetics*.

#### **Week 7: No reading**

#### **Week 8: Eugenics to the Human Genome Project**

- Charles B. Davenport (1917). “The effects of race intermingling” *Proceedings of the American Philosophical Society* 56: 364-368.
- Diane Paul. (1994). “Is human genetics disguised eugenics?” in R. Weir et al, eds., *Genes and human self knowledge: historical and philosophical reflections in modern genetics*. Iowa University Press, pp. 67-83.
- Evelyn Fox Keller. (1992). “Nature, nurture, and the human genome project” in D. Kevles and L. Hood, eds., *The Code of Codes*. Harvard University Press, pp. 281-299.



### **Week 9: Genetic testing and discrimination**

- Julian Savulescu. (2001). "Procreative beneficence: why we should select the best children." *Bioethics* 15(5/6): 413-426.
- R. Bennett and J. Harris (2002). "Are there lives not worth living? When is it morally wrong to reproduce?" in *Ethical issues in maternal-fetal medicine* D. Dickenson, ed. Cambridge: Cambridge University Press.
- Arthur Kleinman (1995). "Anthropology of bioethics," pp. 41-67 in *Writing at the margin: discourse between anthropology and medicine*. Berkeley: University of California Press.

### **Week 10: Virgin births**

- Sarah Franklin. (2007). "Sex" in *Dolly Mixtures: The re-making of human genealogy*, Duke University Press, pp. 19-45.
- Jane Maienschein. (2003). "Hopes and hypes for stem cells" in *Whose view of life? Embryos, cloning, and stem cells*. Harvard University Press, pp. 249-297.

### **Week 11: Assisted reproductions**

- Andrea Tone (2001). "Developing the Pill" in *Devices and Desires: A History of Contraception in America*, New York: Hill and Wang, pp. 203-232.
- Renate Klein (1992). *The ultimate colonisation: reproductive and genetic engineering*. Dublin: Attic Press.
- *Gattaca*. (1997)[Film] Andrew Niccol, director. [Screening to be arranged]

### **Week 12: Minding your own biological business**

- David Herzberg (2009). "Prozac and the incorporation of the brain," pp. 150-191 in *Happy pills in America: From Miltown to Prozac*. Baltimore, MD: Johns Hopkins University Press.
- Jennifer R. Fishman (2007). "Making Viagra: from impotence to erectile dysfunction" in *Medicating modern America: prescription drugs in history*, A. Tone and E.S. Watkins, eds., New York University Press.

- Nikolas Rose (2008). "Race, risk, and medicine in the age of your own personal genome" *Biosocieties* 3(4): 423-439.
- [Explore online: https://www.23andme.com/howitworks/](https://www.23andme.com/howitworks/)

### **Week 13: Biotechnology and diversity**

- Troy Duster (2006). "The molecular reinscription of race: unanticipated issues in biotechnology and forensic science" *Patterns of prejudice* 40(4-5): 427-441.
- Cori Hayden (2003). "Neoliberalism's nature" pp. 48-84 in *When nature goes public: the making and unmaking of bioprospecting in Mexico*. Princeton, NJ: Princeton University Press.
- Debra Harry, Stephanie Howard, Brett Lee Shelton (2000). "Indigenous people, genes, and genetics: what indigenous people should know about biocolonialism" Indigenous Peoples Council on Biocolonialism.

### **Week 14: Biological futures**

- Jacques Loeb (1912). "The mechanistic conception of life"
- Jonathan B. Tucker and Raymond A. Zilinskas. (2006). "The promise and perils of synthetic biology" *The New Atlantis* (Spring): 25-45.
- [Explore online: http://partsregistry.org/Main\\_Page](http://partsregistry.org/Main_Page)
- Freeman Dyson (2007). "Our Biotech Future" *The New York Review of Books* 54(12 - July 19).
- J. Craig Venter, Sarah Franklin, Peter Lipton, Chris Mason. (2008). "Debate: Beyond the Genome: The challenge of synthetic biology" *Biosocieties* 3(1): 3-20.