SYLLABUS

History of Science 139: The Postgenomic Moment
Harvard College/GSAS: 81843
Fall 2010-2011

Professor Richardson
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Office hours: Tuesdays, 10-12, Boylston Hall G26, by online sign-up; and by appointment before and after class on Wednesdays in Science Center 457.

Meeting time: Wednesday, 2-4, Science Center 469

Course website: http://isites.harvard.edu/k72574

What is genomics? How has biology been transformed by the completion of the human genome projects and the arrival of whole-genome technologies? What can the past tell us about the challenges and prospects of the postgenomic age for human societies?

Joining "postgenomic" assessments of the genome projects, this seminar examines the history and contemporary practice of genomics from a multidisciplinary perspective. Topics include the role of technology, government funding, private industry, and race, gender, and nationality in the historical development of genomics; the ways in which genomic research challenges traditional conceptions of biology and science; and the implications of emerging trends such as direct-to-consumer genomics and whole-genome sequencing.

The readings for this course draw from multiple disciplines. A primary goal of this seminar, however, is to deepen our histories of genomics and to place recent postgenomic developments in historical perspective. Students will work with the professor to develop research paper topics that bring to light historical dimensions of contemporary debates about the postgenomic sciences. The class will also collectively work to generate new knowledge and frameworks for engaging the postgenomic moment, through class discussions, exercises, and collaborative projects.

Required texts available at the Harvard Coop and on reserve at Lamont (marked [T] on syllabus):

1. Barnes, B. and J. Dupré (2008). *Genomes and what to make of them*. Chicago, University of Chicago Press. A digital version of this text is available through HOLLIS.
2. Buchanan, A. E. (2001). *From chance to choice: genetics and justice*. New York, Cambridge University Press.
3. Cook-Deegan, R. M. (1994). *The gene wars: science, politics, and the human genome*. New York, W.W. Norton & Co. A digital version of this text is available online at: http://www.genome.duke.edu/books/gene-wars/.
4. Fortun, M. (2008). *Promising genomics: Iceland and deCODE Genetics in a world of speculation*. Berkeley, University of California Press.
5. Koenig, B. A., S. S.-J. Lee, et al. (2008). *Revisiting race in a genomic age*. New Brunswick, N.J., Rutgers University Press.

6. Thacker, E. (2005). *The global genome: biotechnology, politics, and culture*. Cambridge, Mass., MIT Press. A digital version of this text is available through HOLLIS.

Additional required readings will be posted on the course website (marked [E] on syllabus).

Course requirements

Class participation and weekly discussion forum postings	25%
Class powerpoint presentation	15%
Short essay, graphic, or media piece (equiv. of 5 pages) on the topic: What is postgenomics?	10%
Profile of a genomic technology or concept (equiv. of 5 pages; list provided by professor; additional topics may be proposed; prose, graphical, or media format acceptable)	10%
20 unique contributions to online class timeline(s) of the history of genomics	10%
Paper proposal (2 pages) with annotated bibliography (8 top references) & meeting with professor	5%
Final paper of 15 pages double spaced (not including references)	25%

Class meetings

Sept. 8	**Course Overview: "Biology 2.0"** [E] A Special Report on the Human Genome: Biology 2.0 *The Economist* (2010)
Sept. 15	**History of the genome projects** [T] Cook-Deegan parts 1-3 **SIGN-UP FOR CLASS PRESENTATIONS (IN CLASS)**
Sept. 22	**What is (post)genomics?** [T]Barnes and Dupré chapters 1-5 Recommended: [E] Rheinberger (2008), "What happened to molecular biology?" [T] Sober, "The Meaning of Genetic Causation," in Buchanan et al. *From Chance to Choice*, pp. 347-370. **TIMELINE TOOL AVAILABLE AS OF THIS WEEK**
Sept. 29	**The new anti-determinism: Epigenetics, complex disease research, and developmental systems biology** *Short presentation on the interactive timeline tool by Brandon Bentley of Academic Technologies*

	[E] Morange 2002 The Relations Between Genetics and Epigenetics - An Historical View [E] Zhang, T.-Y., & Meaney, M. J. (2010). Epigenetics and the Environmental Regulation of the Genome and Its Function [E] Pennisi, E. 2008, Are Epigeneticists Ready for Big Science? [E] Goldstein 2009, Common Genetic Variation and Human Traits [E] McClellan and King 2010, Genetic Heterogeneity in Human Disease [E] Kitano 2002, Systems Biology: A Brief Overview [E] Fujimura 2005, Postgenomic Futures: Translations Across the Machine-Nature Border in Systems Biology Recommended: [E] http://www.epigenome.org/index.php [E] Weaver et al. 2004, Epigenetic programming by maternal behavior [E] Weaver et al. 2006, Maternal care effects on the hippocampal transcriptome and anxiety-mediated behaviors in the offspring that are reversible in adulthood [E] Stotz 2006, With 'Genes' Like That, Who Needs an Environment? Postgenomics's Argument for the 'Ontogeny of Information' [E] Morange, Post-genomics, Between Reduction and Emergence [E] A New Way to Look for Diseases' Genetic Roots *New York Times* (2010) [E] How to Read a Genome-Wide Association Study *Genomes Unzipped* (2010) [E] De Backer et al 2010, Ins and Outs of Systems Biology vis-a-vis Molecular Biology [E] O'Malley and Dupre, Fundamental Issues in Systems Biology
Oct. 6	**Challenging conventional methods: Bioinformatics** Guest speaker: Hallam Stevens, Visiting Assistant Professor of the History of Science [H] Stevens, "On the means of bio-production: bioinformatics and how to make knowledge in a high-throughput genomics laboratory" *Hard copy to be distributed in class on Sept. 29* [T] Thacker chapters 1-3 Recommended: [E] Joan Fujimura (1999) "The practices of producing meaning in bioinformatics" [E] Adrian MacKenzie (2003). "Bringing sequences to life: how bioinformatics corporealizes sequence data" [E] Timothy Lenoir (2002). "Science and the Academy in the 21st Century: Does Their Past Have a Future in an Era of Computer-Mediated Networks?"
Oct. 13	**Commercial genetics: Private industry & global commerce** [T] Fortun *Promising Genomics* (first half - through chapter X) [T] Thacker chapter 5

	Recommended: [E] McCain (1991) "Communication, Competition, and Secrecy: The Production and Dissemination of Research-Related Information in Genetics" See folder for this date on course site for additional recommended readings **SHORT ESSAY DUE FRIDAY BY 5 PM**
Oct. 20	**The genomic imaginary: Representations of genomics from sci-fi to the IPO** [T] Fortun *Promising Genomics* (finish book) [T] Thacker chapter 9 and Appendix D Recommended: See folder for this date on course site for additional recommended readings
Oct. 27	**Genetics, ethics, & social justice I: Eugenics and its shadow** [T] Buchanan et al., chapters 1-2, chapter 8 Recommended: [E] Genetic Finding May Provide a Test for Longevity *NY Times* (2010) [E] 10,000 Patients to 'Have Genes Mapped' *BBC News* (2010) See folder for this date on course site for additional recommended readings **PROFILE OF A GENOMIC CONCEPT/TECHNOLOGY DUE FRIDAY BY 5 PM**
Nov. 3	**Genetics, ethics, & social justice II: Genetic engineering and human enhancement** [T] Buchanan et al. chapters 3-7 Recommended: See folder for this date on course site for additional recommended readings **MEETINGS WITH PROFESSOR RE RESEARCH PROPOSALS**
Nov. 10	**Race-targeted research and therapeutics** [T] Koenig et al, chapters 5-9 Recommended: [E] Certain genes linked to kidney disease in blacks (2010) See folder for this date on course site for additional recommended readings **PAPER PROPOSAL & ANNOTATED BIBLIOGRAPHY DUE FRIDAY BY 5 PM**
Nov. 17	**Genetic ancestry, identity, and group membership** [T] Koenig et al, chapters 10-13 Recommended:

	[E] The Irish are different - genetically *BioNews* 2010 [E] Behar et al 2010, "The genome-wide structure of the Jewish people" [T] Thacker, chapter 4 See folder for this date on course site for additional recommended readings **ALL SUBMISSIONS TO CLASS TIMELINE DUE FRIDAY BY 5 PM**
Nov. 24	**Gender and the human genome** [E] Richardson [E] M'Charek [E] Nash Recommended: See folder for this date on course site for additional recommended readings
Dec. 1	**Mapping, historicizing, and trending postgenomics: Class workshop** [E] *Nature* special issue "The Genome at 10" (http://www.nature.com/news/specials/humangenome/index.html) [E] *New York Times* articles: "THE GENOME AT 10: Awaiting the Genome Payoff" (http://nyti.ms/dm9RBi) and "A Decade Later, Genetic Map Yields Few New Cures" (http://nyti.ms/aJ1j9y) [E] Implications of exponential growth of global whole genome sequencing capacity *GenomeQuest* 2010 (http://blog.genomequest.com/2010/07/implications-of-exponential-growth-of-global-whole-genome-sequencing-capacity/) Recommended: See folder for this date on course site for additional recommended readings **FINAL PAPER DUE FRIDAY BY 5 PM**

Course guidelines

Course website:
iSites is a primary tool for this course and will contain the discussion forum and many required and recommended readings. Please check the site frequently. Up-to-date syllabus, readings, assignments, handouts, web links, and course announcements will be posted on the course website.

Class announcements:
Details about assignments, schedule changes, and other announcements will be posted on the course website. Special announcements will be sent to your Harvard email account. You are responsible for checking the course website and your Harvard email regularly.

Class attendance:
This is a small discussion-based course that requires your on-time attendance and full participation. More than two absences or late arrivals *for any reason* may lead to dismissal from the course.

Assignments and feedback:
Student work should be submitted in Word format in the Dropbox on the course iSite. The professor will provide feedback using the Word mark-up tool.

Late policy:
Late assignments will incur a 10% penalty per day. If an assignment is due at 5 pm, and you turn it in at 5:30 pm, the highest grade that you can receive is a 90. The professor reserves the right not to provide written feedback on late work. Extensions are granted only with advance notice and usually only in cases of illness.

Office hours:
Please visit me regularly in office hours during the semester. Sign up is online at http://wgs.fas.harvard.edu/icb/icb.do?keyword=k53419&pageid=icb.page377570. If you are absolutely unable to attend the scheduled office hours, email me to set up a time to meet.

Email:
If you email me, please keep it brief and professional. Visit me in office hours if you have detailed questions about the assignments or readings. Please do not rely on email for last minute questions.

Technology policy:
If a laptop or similar technology will benefit you in the classroom and you can use it without being disruptive, you are welcome to use it. Please use your judgment. Consider the positives and negatives for you and your learning style. Attend carefully to your participation in the class discussion. I recommend disconnecting your wifi. Please disable any sounds. The class expects the professor to step in if technology use becomes disruptive.

Statement on disabilities:
If you have a documented physical, psychological, or learning disability, please notify me within the first two weeks of the semester regarding reasonable and appropriate academic accommodations to help you succeed in this course.

Statement on academic honesty:
Academic dishonesty (cheating, fabrication, plagiarism, facilitating dishonesty, submitting the same work for multiple classes) is prohibited and will lead to dismissal from the course and referral to Harvard disciplinary procedures. See:
http://webdocs.registrar.fas.harvard.edu/ugrad_handbook/current/chapter2/academic_dishonesty.htm

Guidelines for Course Assignments

Participation
This is a student-centered seminar in which participation and intensive discussion is essential. Class participation is a central element of this course and will frame my evaluation of your academic performance.

Requirements:
- Consistent on-time attendance
- Completion of assignments by due date - requests for extensions and late assignments are *not* looked upon well

- Bring course readings and notes to class and show evidence of deep reading, preparation, and critical thinking
- Participate vigorously, constructively, and attentively in class discussion
- Generous and invested contributions to course discussion board
- Meet with professor in office hours

Class Presentation

Depending upon enrollment, each class session will have one or two short student presentations. The goal of these presentations is to enrich the class discussion with your perspectives and expertise, provide an opportunity to learn effective use of PowerPoint technology, sharpen your oral presentation skills, and improve your comprehension of the material by teaching it to others.

Sign-ups will be on Sept. 15. In consultation with the professor, you will design a 15-20 minute PowerPoint presentation outlining key concepts of the day's topic and framing discussion questions. Your presentation should effectively use images, multimedia, and textual analysis. *Requires advance meeting with professor.*

Requirements:

- Set up meeting with professor - meet at least 1 week in advance
- Careful reading of the materials
- Email your PowerPoint file to the professor by 12 noon the day of your presentation
- Arrive early on the day of your presentation to get set up

Presentation elements:

- Interest the group in the topic and share what you found interesting, surprising, new, or provocative
- Briefly outline what you see as the key concepts from the day's readings
- Define any key terms
- Briefly outline controversies and debates
- Relate to themes and concepts from the course as a whole
- IMPORTANT: Use images, multimedia, and textual analysis of quotations from the reading to facilitate understanding (make sure to include citations and to caption all images)
- Maximum of 15-20 minutes (~10-15 slides)

Evaluation of your presentation will be based on the following elements:

- *Preparation*: Were you prepared? Is it obvious that you read closely and tried to get help if you needed it?
- *Clarity*: Was your presentation clear? Did you attempt to simplify complex concepts? Was your presentation organized and well thought-out?
- *Content*: Did you address all of the items above? You don't necessarily have to include all of them, but you should try to follow the basic outline.
- *Discussion*: Did your presentation facilitate discussion? How did you answer questions from the audience, if any?
- *Oral communication and presentation style*: Did you speak loud enough? Slow enough? Clear enough? Did you have good eye contact with your audience? Were you responsive to the audience? Was your presentation engaging and interesting?
- *Effective use of PowerPoint technology*: Did the visual presentation enhance and enliven your talk? Did you find novel and relevant images and multimedia?

Discussion board postings
Due: 12 noon the day of class
Our class discussion board will permit the continuation of discussion outside of class and provide an opportunity for you to formulate questions and responses to the readings prior to entering the classroom. These brief written reading responses will also help you identify topics, themes, questions, and material for your final project.

Requirements:

- Post *at least* one item
- Minimum of one type-written page or 500 words (or two 250-word posts)
- Posting must reference readings and evidence critical, original engagement with the texts
- You may skip 1 post with no consequences for your grade
- You are encouraged to be active in the discussion forum and respond to others' posts. These additional postings need not conform to length/content requirements of the required posts.

Short essay
The first written assignment will be a short essay, graphic, or media piece (equiv. of 5 pages) on the topic: What is postgenomics? This first-person essay should concisely advance a bold and creative hypothesis about what defines the "postgenomic moment." You may draw on course readings, ideas developed in our class discussions, and your own background and research. Include any references that you consult or cite on a separate bibliography, not included in the page count. The essays will be compiled into a reader, with a short introduction by the professor, to be posted on our iSite for you to download.

Profile of a genomic concept or technology
The second written assignment is a profile of a genomic technology or concept. Examples might include: microarray, PCR, genome ontology mark-up language, epigenetics, ELSI, pharmacogenomics, bioengineering, HapMap, cDNA library, HER2. The professor will provide a list of key terms and concepts from which you may choose, or you may propose your own topic. This concise piece should be accessible to a general reader. Follow the format of a Wikipedia entry, with clear headings. Define the term or concept, attending to any varying uses of it. Provide a captioned image or figure illuminating the central features of the technology or concept. Locate the concept or technology within the broader context of the genomic and biological sciences, including any debates and controversies, and give a sense of its history and origin. You may draw on course readings as well as your own research. Use credible sources only. Equivalent of 5 pages; prose, graphical, or media format acceptable; include any references that you consult or cite on a separate bibliography, not included in the page count. The profiles will be compiled alphabetically by key term into a reader, with a short introduction by the professor, to be posted on our iSite for you to download.

Class timeline
The third written assignment is to contribute 20 unique contributions to a class timeline of the history of genomics. We will use an interactive tool on iSites. You may add items at any time during the semester, drawing them from your readings and your own research. Each item should contain: the date, a short descriptive title, 1-3 sentences on the significance of the event (including citations: source and page number), and a byline indicating the author (you). The professor will post a sample timeline entry on the iSite tool illustrating the expected format for each entry. The professor will produce a PDF of the final timeline, with a short introduction written by the professor, for you to download at the conclusion of the semester. Add items to the timeline using this spreadsheet:

https://spreadsheets.google.com/ccc?key=0AgIV15vzuYSndGhXUVVnbGgweXE0SmRWNnRRRW1acEE&hl=en&authkey=CJ3ChdII.

Final paper or project

Week of Nov. 1	**Meet with professor to discuss paper idea - REQUIRED**
Nov. 12	**2-3 page proposal with bibliography, minimum 8 sources annotated by email to the professor by 5 pm**
Dec. 3	**Final due (15+ pages, double spaced, page count does not include references) by email to the professor by 5 pm**

The objective of the final paper is to allow you to pursue mastery and in-depth research in an area of special interest to you. The paper should engage your passion as well as your critical and creative faculties, and it should represent in conception and final product the sources, methods, and debates at the heart of this course.

Prior to writing your proposal, meet with the professor to discuss. Then write a 2-3-page (double spaced) proposal laying out your question, the importance of this question to you, the sources and methods you will use, the feasibility of the project in the time allotted, and a brief outline or project plan. Provide a separate annotated bibliography, properly formatted, with at least 8 valid academic sources (these may be from our course materials). Under each citation, write a 1-2 sentence summary of the thesis of the source and its relevance to your project.

The professor will respond to your paper or project proposal. You may be asked to revise certain aspects of your plan based on this feedback. Your final project should be a polished realization of your proposal.

Writing guidelines:

- Advance an original argument or analysis using only your own ideas
- State your thesis clearly
- Use specific examples, quotations, and details to support your argument
- Clean grammar and spelling

Formatting guidelines:

- 15 or more pages of main text
- MS Word .doc or .docx format
- References cited on a separate page, not included in page count; minimum of 8 sources, complete citations in a consistent, recognized academic citation style of your choice
- Double-spaced
- 12 pt Times New Roman font
- 1 inch margins
- Name and page number on the upper right header of each page