LSCI 2040A Genes, Environment, & Behavior Syllabus Fall 2014

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Office Hours: **M 12-1:30pm**/Lang Cafeteria or Room 460, West 11th Street, and by appointment,
Class time: **M/W 10:00am- 11:40am Room 465, West 11th street**

Course Description:

Advances in genetics have increased our understanding of biology and human nature, and at the same time caused us to question some of our longest held beliefs. Historical experiments in **classical genetics** led to the basic concepts of inheritance and the nature of heredity material, but in recent years, the techniques of **molecular genetics** have led to paradigm shifts in policy, law, agriculture, identity, and medicine. As a society, we need to understand the basics of genetic science, appreciate the capabilities and limitations of a genetic approach, and be involved in the debate as to how much we want to know and how we apply what we do know. What does genetics tell us about the basis of life and its propagation? What is the molecular relationship between nature (genes) and nurture (environment)? How can genetics help us understand our behavior? How can DNA data alter our view of identity and kinship? Can an understanding of genetics promote social justice? How does the Human Genome Project alter our understanding of genetic variance/difference/disorders? How do advances in genetics enhance or destroy our quality of life and influence social policy? Can artists and scientists come together to create emergent ideas around genetics?

This is the first course in a series in the **Interdisciplinary Science Major**. The course provides a firm foundation in genetics and prepares students to enroll in the laboratory course *Biodiversity Achieved* offered in alternates years (the next offering is up in the air due to sabbatical), *Cell Biology* or *Imaging Life* (potentially spring 2015), and the advanced level courses *The Science and Politics of Cancer* and *The Human Genome.* For those interested in the history of Social Darwinism, courses focused on *Genes and Race* would be appropriate and these can be found in the NSPE course listings and in the LANT listings. This course is also appropriate for students interested in more health-related courses and a list of such courses (*Intro to Epidemiology*, *Urban Environmental Health, Stem Cells and Social Justice, History of Disease, Health Psychology*) is compiled and posted on the Interdisciplinary Science Website under Resources/Advising and can be found with the prefixes (LSCI, LPSYC, LHIS and LANT). Those interested in Environment can also register for courses in the Environmental Studies Program (UENV) and Sustainability programs at Parsons.

Interactive class sessions will be the main thrust of this course and it is imperative that you come to class having read the material in a **thoughtful** manner. Readings are packed with information tangled with interpretation and opinion, **please bring notes from the readings and as well as the reading itself to the class sessions in a manner that allows you to move quickly from piece to piece (a phone based device is not appropriate)**. You will need to critically evaluate the assigned readings and formulate your own ideas and opinions based on evidence. Readings will be accessible on eReserves via **Canvas** except for those in the textbook, additional readings not accessible through the library and newly published works in fall 2014.

Student Learning Outcomes:

- **Epistemology of Biology**
  a. Point to paradigm shifts in the field of genetics and provide concrete examples of how these shifts were either influenced by or affected society in the past, present, and future.
- **Concepts and Principles:**
  a. Describe the characteristics of organisms amenable to genetic analysis
  b. Identify similarities and differences with respect to mechanism and purpose for four examples of gene and environment interplay (iRNA, transcriptional regulation, signal transduction, and epigenetics).
  c. Organize GXE interactions at different levels of scale (environmental, physiological, cellular, protein)
- **Interdisciplinarity and Empowerment/Applications and Connections to Society:**
  a. To understand how molecular genetics and new technologies can be applied to health and the environment and the access issues surrounding their use and abuse.
  b. To recognize how chemistry, physics, and the social sciences contribute to genetic knowledge
- **Methodologies, Skills and Abilities/Quantitative Reasoning:**

a. To gain an appreciation for the elegance and utility of the genetic approach in answering biological questions, and the limitations of this approach.
b. Predict inheritance patterns, develop and test hypotheses, and solve genetics problems
c. To critically read and analyze biological literature and figures and recognize scale relationships.
d. To conduct literature research using the library, electronic databases, and the internet.
e. To effectively communicate ideas in written and oral presentations.

Assessment:

- Weekly homework assignments (data analysis, oral presentations, essays, and interpretation).
- Small in-class group work to solve genetics problems, debate social policy cases, model processes
- Semester research project: a 3000-5000 word expository paper, many process steps, 30-minute oral presentation.
- Midterm and cumulative final exam
- Extra Credit Assignments: Science Critiques of Movies, books, or seminars on biology topics up to 50pts : NOTE Imagine Science Film Festival is a perfect venue for this http://www.imaginesciencefilms.org/festival/

Course Outline:

Week 1-2: Social issues surrounding genetics and information literacy tutorial/Epigenetics
Week 3-4: Cell structures and division (mitosis and meiosis)
Week 4-9: Classical genetics reviewing seminal experiments (Mendel and non-Mendelian)
Week 9-14: Molecular Genetics (Griffiths, Avery et al, Hershey/Chase, Meselson/Stahl, Franklin, genereg, mutations)
Weeks 15-17: Student presentations of semester project

Course Grading: (subject to change)

Class Participation	100pts
Homework (16-40pts each)	150pts
Controversial Quote Essay	100pts
Semester Project Presentation	100 pts
Semester Project Research Paper	
Progress Report (PR) + Research Tutorial	50 pts
Annotated Biblio+ outline + PR + 1st Page	50 pts
1st Draft + PR/ 2nd Draft +PR	200pts
Critiques (self and peer)	100 pts
Exams (midterm 50/ final 100)	150pts
	1000pts

Scale:

A	94-100%
A-	90-93%
B+	87-89%
B	84-86%
B-	80-83%
C+	77-79%
C	74-76%
C-	70-73%
D+	67-69%
D	64-66%
D-	60-63%
F	59%

Deadline Calendar	**Assignments Due(in syllabus & CANVAS/ Assignments)**
Aug 26 9pm	HW#1: Online Canvas Disc: Questions regarding the syllabus
Aug 27	HW#2: Notes for Discussion on Genetics in the News
Sept 4:	INTERACTIVE RESEARCH TUTORIAL: 4:00pm- 5:30pm;UC Room 618
Sept 8	HW#3: Controversial Quote Assignment
Sept 10	SP#1: Semester Topic And Partner Due
Sept 15	HW#4: Cellular Structure Want Ad
Sept 24	SP#2 Research Tutorial+Progress Report
Oct 1	HW#5 Right and Wrong/ Abnormal and Normal
Oct 8	HW#6 What If Mendel Had Different Results?
Oct 8	HOMEWORK Review Session TBD
Oct 13	HW#7 Genetic Crosses- THESE TAKE ONE WEEK
Oct 15	**Midterm 2 HOURS and then review of the midterm later**

Oct 22	SP# 3: Annotated Biblio, 1st Page, Outline, Refshare, Progress Report
Oct 28	SP #4 Scheduled meeting with Katayoun for SP#2 comments and direction
Oct 29	HW # 8: Molecular Genetics
Nov3	HW #9 Gene Regulation
Nov 5	HW #10 Sickle Cell Chart
Nov 10	SP #5: 1st draft of Paper,Self Critique, Refshare,Progress, Comments
Nov 12	SP #6: Semester Projects Peer Review Due/Canvas and to PEER
Nov 17-Dec1	SP #7: Student Presentations (this is your review for the final exam)
DEC 1	**Final Exam Review Session and Take Home Exam delivered**
Dec 8	**Final Exam – in class 2.5 hours**
Dec 10	SP# 8: Final draft- Self Assessment/ Semester Project Portfolios due

Special Events:

Interdisciplinary Science Site http://interdisciplinarysciencelang.wordpress.com/ Calendar of events
Sept 3: Orozco : Art and Activism Kellen Gallery and Room 5-7pm
Sept 15: Science 2.0 Neoliberal Nirvana. Philop Mirowski Lecture 6-8:00pm Wolff Conf, Rm 1103 6 East 16th Street
Sept 17: Climate Change Week: Many events and one on campus onSept 17th 6- 8:30 Tishman UC RSVP Required
Oct 17-24: The Imagine Science Film Festival: Volunteers needed http://www.imaginesciencefilms.com/
Oct 22-23 The New York Stem Cell Foundation conference http://www.nyscf.org.
Nov 30- Dec 7: World AIDS Day Events on campus and in the city
Science and the Arts Events: CUNY Series each academic semester Dates and topics TBA Site Down right now.
The New York Academy of Sciences: http://www.nyas.org Student membership $35/ yr; free access to events presentations/ppt, readings, on global health, genetics, disease, psych, nanotech, anthro); Science in the City. Also many events are recorded so you can watch remotely. http://www.nyas.org/WhatWeDo/SciencetheCity.aspx

Resources (See "Useful Websites" under Bb Categories)

Blogs alternative news: Sites I use to stay on top of the field and its social dimensions. *The Biopolitical Times* put out by the Center for Genetics and Society is a mainstay **. http://geneticsandsociety.org/** ALSO Alternet and Scidev.net, and the Diversity in Science Carnival Blog http://www.minoritypostdoc.org/view/bloggers.html#carnival

Mainstream Science Sites: *Science Daily Blog, Science News,* and *The Scientist* and *Nature News* have digests of major and breaking research reports some with video interviews explaining the method etc Also the news streaming site, Portside Monitor has a strong focus on social justice.

Animations/Artscience/websites: associated with this class are INSTRUMENTAL, posted in the syllabus or in powerpoint presentations, but there is also the "Useful Websites" document on the Blackboard site**. Artscience highlights each day.**
DNA from the Beginning http://www.dnaftb.org/
DNAi (Interactive) http://www.dnai.org/
Sumanis Animations http://www.sumanasinc.com/webcontent/animations/biology.html

Review Questions and Class Outlines posted on BB to help guide your reading- **look these over before and after reading and class sessions,** so you can focus on the important points and supplemental updated materials. The outlines are updated each year so if you see 2013 in the file name note that it might be updated just before the class session or just after to reflect where this semester's course is going and its pace.

Office hours. You are welcome to come to office hours on a regular basis to discuss anything you like related to the course content; just to talk is fine. If you are having trouble with assignments or readings and would like to use office hours to work through the challenges, we will work through them together, but do this prior to the due date.

The Learning Center should not be saved for the last minute—visit with the writing tutors often to craft your work. You can book an appt online http://www.newschool.edu/learning-center/ . There are also documents on how to research and write an analytical paper on Blackboard. The online Paradigm Online Writing Assistant is also very useful- use the menu at the very top to navigate it http://www.powa.org/

The Libraries- Please note that the library is essential and important resource for this course. It is imperative that you attend the library tutorials and familiarize yourself with research in biology. You will use the Bobst NYU library for most of your research. http://library.newschool.edu ***Our Science Librarian is Anthony Dellurificio and he is happy to help you one-on-one.*** dellurea@newschool.edu

Semester Project Folder on CANVAS: Tutorials, guides, samples in sequence; please review by second day of class. The documents here are placed in order and the first lays out the entire timeline for the project over the 15 weeks.

Course Expectations

Policy on Attendance and Lateness Policy: Absences may justify some grade reduction and a total of four absences mandates a reduction of one letter grade for the course. More than four absences mandate a failing grade for the course, unless there are extenuating circumstances, such as the following: an extended illness requiring hospitalization or visit to a physician (with documentation); a family emergency, e.g. serious illness (with written explanation);observance of a religious holiday. In case of personal and medical emergencies, students should contact their instructors as well as the Director of Academic Advising. The attendance and lateness policies are enforced as of the first day of classes for all registered students. If registered during the first week of the add/drop period, the student is responsible for any missed assignments and coursework.

Participation is key to seminar pedagogy and you are expected to attend classes regularly and promptly. Missing class in genetics is going to be difficult as there is material not in books covered in class; If you miss class it is your responsibility to check with your peers and Blackboard for changes or updates and obtain class notes. Due to the accelerated nature of this course, students should miss no more than one class.

Policy on Late Assignments: Assignments guide you through new material. Some questions will be thought provoking and many will involve writing and you will be required to meet with the Science Fellow. Your weekly assignments make up the majority of your final grade. If LATE, they will be corrected but your score will drop 10% per day late. Late assignments will be allowed only due to extenuating circumstances and will require prior approval. I discourage late homework, because it does not allow me or you to assess your learning in a timely and effective manner and prevents us from addressing those aspects that are unclear or confusing from the beginning. In case of personal and medical emergencies, students should contact their instructors as well as the Director of Academic Advising.

Exams:

There will be two exams in this course. The midterm exam will cover classical genetics. I will give a final cumulative exam that will be based on problem solving and integration of topics throughout the course, both classical and molecular genetics. Short answer and essay style questions will be included and the questions will reflect past homework assignments… in other words… no surprises for the well-prepared. All appeals of grading must be submitted in writing.

Academic Honesty and Integrity: Compromising your academic integrity may lead to serious consequences, including (but not limited to) one or more of the following: failure of the assignment, failure of the course, academic warning, disciplinary probation, suspension from the university, or dismissal from the university. The New School views "academic honesty and integrity" as the duty of every member of an academic community to claim authorship for his or her own work and only for that work, and to recognize the contributions of others accurately and completely. This obligation is fundamental to the integrity of intellectual debate, and creative and academic pursuits. Academic honesty and integrity includes accurate use of quotations, as well as appropriate and explicit citation of sources in instances of paraphrasing and describing ideas, or reporting on research findings or any aspect of the work of others (including that

of faculty members and other students). Academic dishonesty results from infractions of this "accurate use". The standards of academic honesty and integrity, and citation of sources, apply to all forms of academic work, including submissions of drafts of final papers or projects. All members of the University community are expected to conduct themselves in accord with the standards of academic honesty and integrity. Students should refer to the Policy on Academic Honesty http://www.newschool.edu/WorkArea/DownloadAsset.aspx?id=81698 and **Intellectual Property**. http://www.newschool.edu/studentservices/rights/other-policies/int-property/

Bibliographic Requirements: Connected to the policy on academic honesty and plagiarism is the practice of referencing your resources in appropriate citation and bibliographic format. EVERY assignment should practice academic bibliographic format. The university has purchased Refworks, a software package that allows you to organize and customize your reference libraries. There are also online and in-person tutorials for this software.

You must have a current student I.D., use the internet and electronic databases for research, and use Blackboard. To help you with these resources we will discuss information resources, complete a tutorial, and learn how to organize and retrieve personal resources using bibliographic software (**Refworks).**

Students with Disabilities. As an educator, I firmly believe in supporting all students in their educational pursuits and encourage those who seek additional support to come and see me early in the semester. The New School Students Disability Services (SDS) assists students with disabilities in need of academic and programmatic accommodations as required by the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Federal Rehabilitation Act of 1973. In keeping with the University's policy of providing equal access for students with disabilities, any student requesting accommodations must first meet with Student Disability Services. A designee from the Student Disabilities Services (SDS) will meet with students requesting accommodations and related services, and if appropriate, provide an Academic Adjustment Notice **for the student to provide to** instructors. The instructor is required to review the letter with the student and discuss the accommodations (not the diagnosis), provided the student brings the letter to the attention of the instructor. This letter is necessary in order for classroom accommodations to be provided. Student Disability Services (SDS) is located at 80 5th Avenue on the 3rd Floor. The phone number is (212) 229-5626. Students and faculty are expected to review the Student Disability Services webpage. The webpage can be found at http://www.newschool.edu/studentaffairs/disability/ and the office is available to answer any questions or concerns. A more detailed menu is available for students: http://www.newschool.edu/studentservices/disability/students/

For students interested in getting assessed, Counseling Services collaborates with the Clinical Psychology program on campus to offer psychological assessments which might be helpful for students who have trouble taking tests, concentrating, or keeping up with school projects; are worried that their emotions are interfering with academic success; feel that they are not reaching their potential; and/or concerned that they may have attention deficit disorder (ADD) or a learning disability. The assessment includes in-depth feedback about your test results and recommendations. In some cases, the test findings may be used as documentation to request academic accommodations through New School Student Disability Services.

Everyone learns differently and we think and approach learning in unique and important ways. Each of us can improve on our own learning style by sharing learning stories with one another that give us insight into cognitive organization skills that allow us to retrieve, utilize, and expand our skills and content knowledge. Anyone who feels that they may have a learning difference that has not in the past been supported by traditional linear text-based courses should inquire about accommodations that support diverse learning styles and support success. As more students step forward enriching the ways in which we teach and learn, more supports have emerged. For instance, there is a student-founded advocacy and support group "Eye to Eye," which has resources, suggestions, and mentors available for students, faculty, and administrators. http://www.projecteyetoeye.org/index.html

Textbooks

Books can be purchased through BlueStockings, a cooperative bookstore, café and activist center located at 172 Allen Street (one block south of the F train's 2nd avenue stop). Bluestockings refers to the Venetian (1400s) and European female literary scholars (1700s) that self organized in protest to the high class all-male salons of the times, The Blue stockings name arose from the fact that rural women could not afford thin stockings and wore dark wool blue stockings. Store representatives will attend the second class and bring books for purchase- so please bring cash or credit.

Required-you must buy or use the library (Cummings is about $240 new, but used is fine and the 9th edition is also fine, and you can also rent the relevant chapters in an online format) Zinsser $15

1. **Michael Cummings. *Human Heredity: Principles and Issues*. 2011. 9th Edition. BrooksCole Publishing, Thomson Learning.** This text serves as the primary text for this course. It is very "textbook" like although it is much easier to read than most traditional texts. Access to an Coursemate (flashcards, exercises, outlines, web links, quizzes) accompanies a **NEW** copy of the book for an additional $10, whereas used versions do not have these options but the electronic database is similar to the New School Library access to Proquest. Earlier editions can be bought through Barnes and Noble or Amazon for much less, but there is usually a lag time for used books. Bluestockings will have the 9th edition. You can also rent the relevant chapters from the publisher. This text is referred to as **HH** in the syllabus.
2. **Zinsser, W. On Writing Well.** St. Martins Press. NY, NY. This text is essential for writing.
3. **Articles and excerpts. Collection of articles and other book chapters.** These readings will be referred to in **Ereserves** which is linked to **CANVAS** and can be identified by the last name of the author. The link is http://ereserves.newschool.edu . There will also be some readings and items that are more current and posted on CANVAS under Other Readings. So please always look here or use your information literacy skills to locate items in the library.

Strongly Recommended Texts:

1. Russo and Cove. *Genetic Engineering: Dreams and Nightmares*. Oxford University Press. New York. 1996. This text will serve as an alternate text for the course and does not have a "textbook" feel. Former students have chosen to purchase this book and read the corresponding chapters from this book before reading **HH**. This text is referred to as **D&N** in the syllabus and several chapters will be posted on Canvas but you may want to have a copy of your own. It is out of print, so you need to buy on Amazon or The Strand.
2. Baker C. 2000. *Behavioral Genetics.* AAAS. http://www.aaas.org/spp/bgenes/publications.shtml An extremely valuable free online book that discusses how genes and environments interact through development to shape differences in mood, personality, and intelligence. Please note that other links are available, but the book chapters appear as links at the bottom of the page.

Optional Texts:

3. HHMI. 2001. *The Genes We Share*. An online textbook that highlights the need for genetic model organisms and includes work on worms, flies, mice and reviews alcoholism, sexual development, and cancer. http://www.hhmi.org/genesweshare/
4. Ridley M. 2000. *Genome: The Autobiography of a Species in 23 Chapters.* Perennial of HarperCollins Publishing. NY, NY. This text is unique in that it is not a comprehensive story of the genome. Rather, Ridley has chosen various disorders, behaviors, and ideas and used them to engage the reader in a discussion of the critical pitfalls and breakthroughs that the Human Genome Project has presented us. The text is designed for a novice and was on bestseller list for the year 2000.
5. Ridley M. 2003. *The Agile Gene: How Nature Turns on Nurture.* Perennial of HarperCollins Publishing. NY, NY. This book recounts the hundred years' debate over nature versus nurture, suggesting that it might best be replaced by a new image of nature and nurture working in tandem. He argues that genes are designed to take their cues from nurture, and that nurture is also dependent on genetic makeup. Academic but accessible to the general reader.
6. *Controlling our Destinies: Historical, Philosophical, Ethical, and Theological Perspectives on the Human Genome Project* /edited by Phillip R. Sloan. 2000.University of Notre Dame Press. Notre Dame, Indiana. This text contains papers that were written as a result of a conference held in 1995 at Notre Dame that was supported by a ELSI grant. The format is interesting because each paper is accompanied by an analytical response paper.
7. Krimsky, Sheldon and Kathleen Sloan. *Race and the Genetics Revolution* and Krimsky, Sheldon, and Tania Simincelli. *Genetic Justice* both published by Columbia University Press. Both use a social justice frame to debunk myths regarding a biological basis for racial divides. Krimsky is a member of the Council for Responsible Genetics and also teaches a summer course on Toxic Justice at The New School for Public Engagement each summer.
8. Sykes, B. 2002. *The Seven Daughters of Eve*. Norton W.W. and Company. NY, NY. This text is very conversational and reviews the use of mitochondrial DNA to trace human origins and presents opposing theories about how we evolved.

9. *The Code of Codes: Scientific and Social Issues in the Human Genome Project.* 1992. Edited by Daniel Kevles and Leroy Hood. Harvard University Press. Cambridge, MA. This text tackles ethical, legal and social issues dedicating a chapter to each. Although published in 1992, the questions and solutions posed here are still relevant. Again this text is written for the novice but some chapters are very technical. These chapters will require you to reread the material a few times in order to appreciate the concepts that are presented.
10. R. Hubbard and E. Wald. *Exploding the Gene Myth*. Beacon Press. Boston, MA. 1993. This text deals primarily with the ramifications of the misinterpretation and misuse of genetics by society.

Class Schedule: Readings posted on BB:

This schedule is FLEXIBLE and will change based on the student composition of the class. Please bring syllabus and that class session's reading to EVERY session. The most up to date version can be found on the CANVAS with questions and class outlines posted to help you grasp the most important points of the readings. Any reading not in Ereserves should be located and obtained by you using the library, or CANVAS. Reading is to be completed by the date listed. If there is any issue with access to a reading contact me immediately so I can rectify the situation.

Date Topic READINGS ARE TO BE COMPLETED BEFORE CLASS SESSION

Week 1: Genetics and Society: Inside and Out

Aug 25 Introduction: Class Introduction: "Similarity is the Shadow of Difference"—Matt Ridley
What, Why, How, For What Reason... (DNA image, learning, body map)
We will introduce ourselves, review the course materials (Canvas) in the context of social justice, and analyze the iconography of DNA and the cultural meanings it holds in light of the bioecological model: a model that emphasizes the important and dynamic relationship between genes and their environments. We will also explore the placement of genetics as a field in biology and how it is increasingly being used as a tool in many disciplines including nanotechnology, synthetic biology, psychology, environmental sciences, and bioart (in vivo and in vitro). We will use a parable to discover how biologists ask and answer questions about the world and society.
Reading in Class:
Stephens, T. The geneticist and the biochemist. University of California Santa Cruz Review. 2004. [accessed 10 August 2011]. http://www.cbse.ucsc.edu/news-article?ID=1511 . Consider the differences between the genetic and biochemical approach to solving biological problems as described in this allegory. Note that at the link for the Kellogg piece there is a link to the Sullivan piece.

- Kellogg, D. The Demise of Bill. Genetics Society of America Newsletter, April 30 1993. GENErations 1(3).
- Sullivan, B. The Salvation of Doug. Genetics Society of America Newsletter, April 30 1993. GENErations 1(3).

Aug 27 Class Discussion: Genetics in the News (Canvas) Assignment
How are genetics and geneticists viewed by members within the biological community and those outside of it?
The Genetics in the News articles are designed to pique your interest, inspire you to ask questions, and consider topics that you may want to research further on your own for the semester project or otherwise.

In Class video: China and Genes: http://www.cnn.com/video/#/video/world/2009/08/04/chang.china.genetic.gifts.cnn
In Class video: Lorigen Engineering Viral Video: http://www.biopoliticaltimes.org/article.php?id=5338 (extra credit)
In Class video: Dnews Epigenetics on Huffington Post: http://videos.huffingtonpost.com/how-to-change-our-own-genes-517806494
In Class video: Microaggressions: Marcus Turner's Class http://vimeo.com/m/71554570 (password fine1)

HW#1 DUE: Review **FULL Syllabus** (20 pages) **on Canvas** and **post 3 questions** regarding the syllabus by Tuesday Aug 26th 9:00pm.

HW#2 DUE: Sharing Genetics in the News with peers. **Review Assignment 2** on Canvas; be prepared to share a 3' oral summary and questions with the class. Think about how to share information quickly,: Who is the author, where is it published and why? What is most important, provocative? What is the topic/ question/ controversy? What is the methodology, approach (think Bill and Doug) ? If a chart, image, flow chart, of schematic will help you convey information quickly be prepared to share these.

If you missed the first day of class and/or can't access Canvas, use this topic: Direct to Consumer Testing is a new phenomenon with new private personal genetics testing companies expanding services and the resources below

- **Reynolds, J. UC Berkeley.** Public Interest Group Applauds the end of UC Berkeley's Controversial Genetics Testing of Incoming Students. CGS. August 12, 2010. http://www.geneticsandsociety.org/article.php?id=5321
- **Anniversary of Direct To Consumer (DTC) Genetic Testing Regulation. Aug 31 2009** NAS Hearings C-SPAN 2 (Sandra Soo-Jin Lee and Ferreira Gonzalez response to 23andMe , at 00:57:57. For information on FDA versus CLIA regulations and oversight. http://www.c-spanvideo.org/program/288618-2

Week 2: The History and Future of Genetics

We will trace the history of the field of genetics; how it emerged as a discipline and its applications in society, specifically reviewing the shift from social eugenics to individual eugenics as well the notions of positive and negative eugenics practices. We will also consider the ways in which language can influence attitudes towards genetics and communities. Taking very different views on the use of language Weiss, SEED, and the Evelyn Fox Keller monograph (next week) explore this more deeply. The last three entries speak directly to the idea of naming mutants based on phenotypes; many of which are not socially just. The reading is substantial this week, so be sure to pace yourself over the holiday weekend and take copious notes so you can refresh the day of class.

Sept 3 History of Genetics and its Applications (Timeline)
Hand out in Class: Drosophila Naming Names. SEED Magazine. Nov 2006. (1 page)
Reading:

1. **D&N:** Chapter 15, 16 and 17 (50 small pages)
2. **HH:** Cummings. Chapter 1, from **the 9th/ 10th edition** OR **Chapt 1 from the 4th edition see Bb** (20 pages of textbook reading history).
3. Muller-Hill, B. 2001. Genetics of Susceptibility to Tuberculosis: Mengele's Experiments in Auschwitz. Nature Genetics Reviews. (2): 631-633.
4. Weiss, R. Mutant Monikers A tale of freaky flies and gonzo geneticists. Science News. Jan 12, 1991. (4 pages).
5. Hoffman, A. Jan 13, 2012. Scientists Name Species of Fly After Beyonce. Exclaim.ca. http://exclaim.ca/News/scientists_name_species_of_fly_after_beyonce
6. **IMAGE ARCHIVE:** Visit and browse the DNA Learning Center http://www.eugenicsarchive.org/html/eugenics/index2.html Eugenics Archive of photos and information.
7. **INTERACTIVE on FEMALE STERILIZATION FAMILY PLANNING on WOMEN of COLOR:** http://toolness.github.io/mas-bebe-itvs-sprint/

Optional

1. Young, R. 1985. "Malthus and the Evolutionists: The Common Context Between Biological and Social Theory." *In* Darwin's Metaphor: Nature's Place in Victorian Culture. Cambridge University Press: New York: 24-55. http://www.human-nature.com/dm/chap2.html
2. Eugenics in California: Legacy of the Past? Aug 28, 2012. Center for Genetics and Society. http://www.ustream.tv/recorded/25023111 (84 minutes long) For much of the 20th century, California was at the forefront of eugenic ideology and practices in the United States, and holds the dubious distinction of being the state with the highest number of eugenic sterilizations performed under the authority of law – some 20,000 procedures between 1909 and the mid-1950s. Coerced sterilizations continued in public hospitals into the 1970s, and it has recently come to light that in very recent years, women prisoners in California have been sterilized without their consent or knowledge. Today, California is a leader in research and services related to

human genomics and assisted reproductive technologies. Speakers at this public event will consider the long history of eugenics in California and explore continuities and discontinuities in the uses and misuses of genetic ideas and practices. SPEAKERS: Dean Christopher Edley, Berkeley School of Law, will give opening remarks to welcome attendees. Troy Duster, Chancellor's Professor and Senior Fellow at the Warren Institute for Law and Social Policy, UC Berkeley, will moderate. AT 20 Minutes is the good stuff Miroslava Chávez-García Professor of Chicana/o Studies, University of California at Davis and Alexandra Minna Stern Professor of History of Medicine, University of Michigan. At 34 minutes you see video interviews with mothers that were sterilized.

Sept 4 (Thursday ****Research Tutorial session hosted in Room 618 University Center: 4:00pm- 5:30pm **
Please attempt to complete the Library Research tutorial on your own and exploring a topic for your research paper. This session will address the most pressing/common challenges and provide you with some basic but essential tools to make research more efficient and enjoyable. Note that we have Science Specific Librarian, Anthony Dellureficio dellurea@newschool.edu and you can contact him to learn more about how to do research and organize a group session or one on one session with him.**

Week 3: Epigenetics Resurrected

When biologists were trying to understand speciation and extinction there were complementary notions on evolutionary processes. Though Darwin and Lamarck were often referred to as rivals, they were not, and instead respected one another's ideas about the process of inheritance. The longer monograph by Evelyn Fox Keller is an important contribution to the history of science, and uses a feminist perspective to retrace the events and influences on the field of genetics. Her coining of the phrase " discourse of gene action" is important to hold throughout the semester and for each of to grapple with that definition of gene action. The Brown article is a biographical sketch of Keller and the ways in which the inhospitable environment of lab life in physics eventually pushed her into mathematical biology. She later rote the biography of a famous female scientist Barbara McClintock whose work will be reflected in the MacPhail piece for the next class session and Brown also discusses her arguments with Lewis Wolpert who was famous for saying " It is not birth, marriage, or death that is the most important moment in life, but gastrulation."

Sept 8: The Birth of Genetics and Things to Come
HW #3 DUE: Controversial Quote Essay Due-connect at least 2 course resources to build your essay; one should be Keller)
Reading:
Keller E. "Language and Science, Genetics, Embryology, and the Discourses of Gene Action" in Refiguring Life. Columbia University Press. New York: 3-42 NEED COPYRIGHT CLEARANCE from ERESERVES STAFF.

Optional Brown, A. Nov 3, 2000. Fox Among the Lab Rats. The Guardian (~ 5 pages)
http://www.theguardian.com/books/2000/nov/04/books.guardianreview6

Sept 10 : Epigenetics, Genes and Environment: Nutrition
*Here we see that though Lamarckian Evolution was mocked for some time, it turns out that Lamarck had it right. With a contemporary twist, Keller (with references to the microenvironment of the genes; cytoplasm and cell niche), Waterland (with reference to the pregnant mother's macro diet environment), and Turkheimer (with reference to SES and intelligence) highlight the important of gene X environment interactions (GxE). They are able to hypothesize about the molecular processes that Lamarck had envisioned so long ago. The collection of news, video, and research articles for the diet and genes effect will be echoed throughout the semester and is called the "telephone game" or "science traveling through space and time." What can be seen by tracing the science from the news back to the original article is a muddling of the scientific method, the details of the study, and an exaggeration of the results and conclusions. We can spend an entire semester arguing about whether an IQ test is appropriate measure of intelligence, but the focus of the Weisss news piece not so much the type of test, but the approach to rectifying an education gap. What is introduced in the Weiss/Turkheimer pieces is the notion of a **conditional phenotype**; a phenotype that only emerges in a particular*

environment and in this case that environment is one that is resource poor The piece by McPhail returns to the notion of language that is introduced by Fox Keller, but here the topic is "jumping genes" or transposons, or vestigal viral sequences; the same segments that resulted in the variance seen in the Waterland and Jirtle work. Macphail is quite eloquent in the use of metaphor, but consider whether there may be repercussions to this literary approach.

*****SP#1: Semester Topics Due: Use the Canvas Discussion Area to share ideas and claim a topic (try to identify a partner and a topic) Semester Topics are available in the Assignments Folder Labeled SP#1: Semester Topics**

Video: The Ghost in Our Genes. 2007. PBS. http://www.pbs.org/wgbh/nova/genes/mice.html
Video : Star Trek. Next Generation " Genesis"
http://www.cbs.com/shows/star_trek_the_next_generation/video/WTG1lB9tFbPn1i6Qo3dO9dsY9AcAyVn1/genesis/
Artwork: Genes 2 Brain 2 Mind 2 Me. Dec 16 2009. http://genes2brains2mind2me.com/2009/12/16/epigenetics-and-cognitive-development-quick-sketch-overview/

1. Blakeslee S. A Pregnant Mother's Diet May Turn the Genes Around. *New York Times.* October 7, 2003. http://people.ccmr.cornell.edu/~ginsparg/Phys446-546/fa03/nyt07oct03epi.html
2. Anonymous. Dec 19,2011. High fat diet leaves its mark on sperm. New Scientist http://www.newscientist.com/article/mg21228434.900-highfat-diet-leaves-its-mark-on-sperm.html
3. Waterland RA, Jirtle RL. (2003).Transposable elements: Targets for early nutritional effects on epigenetic gene regulation. *Molecular and Cellular Biology* 23(15): 5293-5300. http://mcb.asm.org/cgi/reprint/23/15/5293 This is a heavy research article and the basis of the Blakeslee news piece. Skim it and focus on the introduction, the approach, and the conclusions.
4. Weiss, R. 2003. Genes Sway Over IQ May Vary With Class Study: Poor More Affected by Environment. Washingtonpost.com, Tuesday, September 2:A01. http://www.racesci.org/in_media/iq_class.htm Close reading and make/bring notes on scientific method and analysis (how many studies, sample size, location, methods)
5. MacPhail, T.M. September 2004. The Viral Gene: An undead metaphor recoding life. Science and Culture 13(3):325-345. Long but quite a literary piece and one that is important in understanding jumping genes and engineering.
6. Anonymous. Science and Technology: Learning without learning; Epigenetics. The Economist. London: Sep 23, 2006. 380 (8496): 93.
7. Dolgin, E. Aug 2009. Epigenetic Suicide Note. The Scientist 23(8):18.
8. Singer, Emily. Feb 4, 2009. A Comeback for Lamarckian Evolution? Technology Review. Short review from 2009, but connects many of our readings over the last few class sessions.

Optional:

1. Turkheimer et al. 2003. Socioeconomic status modifies heritability of IQ in young children. *Psychological Science*. 14(6):623-28. This is a research article and full of statistics, but we will analyze some of the figures in class together, so come to class prepared to outline the scientific method (observations, questions, hypothesis, method, sample,[size, number, form of recruitment] experiment, results, conclusions) and be sure to bring in your own observations in comparing this article with the Weiss news piece.
2. Jablonka , Lamb, and Avital. 1995. Lamarckian Mechanisms in Darwinian Evolution. Trends in Ecology & Evolution 13 (5).This is a rather heady article, so take some time with it.

Week 4: Genes, Cells, Bodies and Environment

Sept 15 Cell Theory, Cell Types, Cell Structures, Cell Environments: Molecular Processes

We shift our attention from the macro scale to the cellular scale and begin to gain an understanding of the cell parts, their organization, function, and relationships. Here environment takes on a new meaning as microniches are created: the nuclear environment, the cytoplasmic environment, and the localized structures which increase apparent concentrations of specific interacting proteins that promote "self assembly" As we investigate cell structures and their function we can consider molecular targets at play in the GXE effect. Given what you know about learning, neurons, etc.

how might variants in cell structure relate to the ability to learn in a resource poor environment? How does the Singer, Weiss, Waterland- Jirtle and Dolgin papers connect to those assigned for today with respect to intergenerational effects.

HW#4 Due:. If you have completed this assignment in another course I will ask you to instead play CellCraft and report back on what you learned in a reflective essay… see if you can get to level 6 viral invasion http://www.kongregate.com/games/CellCraft/cellcraft).
Art: Mara Haseltine's The Cell Garden Project http://www.calamara.com/cellGarden.html and http://www.calamara.com/mito.html
In Class Video: Inner Life of the Cell. HHMI http://www.studiodaily.com/2006/07/cellular-visions-the-inner-life-of-a-cell/
Images: The Cell Image Library: http://www.cellimagelibrary.org/
Reading:

1. **HH:** Chapter 2, 7th edition 18-25, OR 6th edition p 16-23, OR 4th edition p. 14-22. Read this section and think about what kinds of cells might change their structures or shape in response to becoming specialized or being in a different environment.
2. **D &N:** Chapters 2,3 (this is chemistry background to assist you with the atomic, molecular, and **cellular scale)**
3. **INTERACTIVE:** Visit: http://www.johnkyrk.com/CellIndex.html rollover the structures of the cell and click on structures to learn more . Remember to use this site periodically during the course of the semester
4. **NEWS ITEMS:** New Role for the Endoplasmic Reticulum in Mitochondrial division. http://www.news.ucdavis.edu/search/news_detail.lasso?id=9998

Optional :Cell Craft: A video online game that helps you see cell structures in action and understand their history and why they are central to cell survival. http://www.kongregate.com/games/CellCraft/cellcraft).

Sept 17: Cell Division and Regeneration: Mitosis

*Cell division is a highly regulated process. In fact, when cells are not capable of responding to environmental cues appropriately and divide when there are limited resources, pathology develops and this can be recognized as cancer. Cell division is also about **scale**; when a cell makes copies of itself (cloning or mitosis) to regenerate tissue it does very different things with the genes than it does when it intends to reproduce the species (gametogenesis or meiosis). Yet there are some species or one celled organisms that are capable of using mitosis for reproduction. It is easy to see how things get confusing. To keep things simple think about scale… is it the species or a cell type that is the goal? Then consider what would be important to maintain in each of these scenarios.*
In Class Video: Connie Chung Special Report on couple who wants to do reproductive cloning 30 minutes
Reading:

1. **HH**: Chapter 2, 7th edition 26-39, or 6th edition p. 23-33, or 4th edition p.24-33.
2. **D&N:** Chapter 5

3. **INTERACTIVE:**
    a. **Human Mate Choice:** Visit this site to understand how human mate choice is based on the desire to create more genetic diversity in the human gene pool http://www.pbs.org/wgbh/evolution/library/01/6/l_016_08.html
    b. **Cell Cycle Game:** This might seem juvenile but it really helps you understand the cell cycle. http://www.nobel.se/medicine/educational/2001/
4. **VIDEO:** Furtado, Sonia. April 1, 2010. Movies for the human genome. Eureka Alert. European Molecular Biology Lab. VERY COOL siRNA Video Study http://www.biosciencetechnology.com/News/Feeds/2010/03/products-instrumentation-movies-for-the-human-genome/

Week 5: Reproduction and Development

Sept 22: Two Cells Become One: Gametogenesis (meiosis) and Fertilization **

We will explore cultural stereotypes around gender in science through Beldecos which challenges the notion of gender specific science stories, and with Schatten which was the seminal work that eventually led to the publication of the famous feminist piece by Emily Martin titled "The Egg and the Sperm." We will also assess your understanding of the similarities and differences between the two essential types of cell division in the gonads (mitosis and meiosis) via a collaborative Four Square exercise. In this exercise we will be concerned with comparing the cellular and molecular steps in each type of cell division and for what ultimate purpose. How is diversity evoked here? How do asexual organisms infuse diversity into their gene pool? Is the molecular mechanism at the end of the day the same or different? See the last two short news piece to get some clues.

Art: The Storey Sisters "Primitive Streak" Click on the link to the left to the whole story and view the photographs **http://www.helenstoreyfoundation.org/china/frame.html**

Reading:

1. **HH:** Chapter 2, 7th edition 290-294 and 150-162, or 6th edition p 33-43, OR 4th edition p. 33-45.
2. Schatten G, Schatten H. 1983. The energetic egg. *The Sciences* 23(5): 28–35.
3. Beldecos, A. et al. (The Biology and Gender Study Group). March 1988.The Importance of Feminist Critique for Contemporary Cell Biology. Hypatia. 3 (1): 61-76.
4. Anonymous. March 28, 2003. Human sperm may "smell" their way to the egg, Science study Suggests. Science Daily. http://www.sciencedaily.com/releases/2003/03/030328073214.htm
5. VIDEO and INTERACTIVE:
    a. Visit Animations of Meoisis. http://www.sumanasinc.com/webcontent/anisamples/majorsbiology/meiosis.html
    b. View Pearson Chapter 19 animations of spermatogenesis and oogenesis in the human body. http://wps.aw.com/bc_martini_eap_4/40/10469/2680298.cw/
    c. Nucleus Medical Media Animation. 2009. Ovulation. You Tube. http://www.youtube.com/watch?v=nLmg4wSHdxQ
    d. Shering-Plough. 2011. The Normal Female Reproductive System Animation. http://www.youtube.com/watch?v=WGJsrGmWeKE (nice coordination with the brain)
    e. Ovarian Cycle http://www.sumanasinc.com/webcontent/animations/content/ovarianuterine.html
    f. Visit the Nova 18 Ways to Make a Baby site http://www.pbs.org/wgbh/nova/baby/cloning.html
    g. Visit Life's Greatest Miracle, sections 1,2, and 3 – unfortunately this site no longer allows for advancing the video nor does it have the program in separate sections! http://www.pbs.org/wgbh/nova/miracle/program.html

Sept 24: Cell Division Continued with Punnett Square connection

SP#2 DUE:: Research Tutorial and Progress Report for Semester Project see Canvas/ Semester Project, and post to Canvas/ Your Group Page

Using the alternative conceptions of cell division and the cell cycle we will discuss how one cell becomes four, and why independent assortment and recombination are two important events that lead to genetic diversity that allows a species to survive a changing environment. What organisms have the ability to choose mitosis or meiosis for reproductive purposes and what informs that choice? What is mating type switching? What of organisms that reproduce asexually; how do they survive changing environments and infused their genomes with diversity (bacteria, rotifers, etc).

Readings

1. BBC. Eighty million years without sex BBC news. October 12, 2007. http://news.bbc.co.uk/2/hi/science/nature/7039478.stm
2. Watson, Traci. Nov 15, 2012. Bdelloids surviving on borrowed DNA. Science Now. http://news.sciencemag.org/sciencenow/2012/11/bdelloids-surviving-on-borrowed-.html?ref=hp

In Class Activities in PPT on Cell Cycle and Division (1,2,3)
In Class Activity 1: Clones versus gametes.
In-Class Activity 2: Depict mitosis and meiosis using modeling clay.
In-Class Activity 3: Who to Clone?

******Please meet with me and your peers to review Mitosis with Clay- or my office hours or by group appt**

Week 6: Chromosomes : Sex and Gender

Sept 29 Chromosomes and Mitochondria: The Vehicles for Inheritance

As scientific advances lead to new technologies that allow us to have greater and greater resolution of scale, our hereditary material (our chromosomes) have come under greater scrutiny. Here Susan Anker and Karen Dowsen provid artistic social commentaries on the meaning of a karyotype and genetic origins, while Rayna Rapp lends us a deeper view on the burden of decision making.

Art: Susan Anker's Codex http://www.suzanneanker.com/artwork/?wppa-album=6&wppa-cover=0&wppa-occur=1
Art: Susan Anker's Zoosemiotics http://www.suzanneanker.com/artwork/?wppa-album=15&wppa-cover=0&wppa-occur=1
Art: Dowsen, Karen.2002. Chromosome Puzzle. Field Museum Chicago, IL. This acrylic puzzle explores the artist's experiences with the learning disorder dyslexia, as well as the genetic origins of the condition. Dowson refers to the work as a self-portrait—it was inspired by IQ tests that she took as a child; the puzzle pieces are images of her own chromosomes. http://www.katharinedowson.com/gallery
Art: Glover., Gina. 2002. Chromosome Stripey Socks. Field Museum. Chicago, Il. http://ginaglover.com/posters-prints/
In Class Video: DNA Watson: Down's Syndrome and Eugenics

Reading:
1. **HH:** Cytogenetics and Reproduction-Chapter 6. Chapter 7 in 4th, 5th or 6th edition. Or 7th edition Chapter 6 120-149 and Chapter 7 164-177. **SKIM**
2. Salleh, A. 1999. The origin of the sex chromosomes. 2005. http://www.abc.net.au/science/articles/1999/10/29/63100.htm
3. Ridley, M. "Species" in Genome: an Autobiography of a Species in 23 Chapters. Perennial Press. 2000: 23-37
4. Edlin, Mongolism. How Prejudice Created a Description for a Hereditary Disease. p. 246. Human Genetics. Jones and Bartlett Publishing. 1990.
5. Rapp, Rayna. 1997. Communicating about chromosomes: Patients, Providers, and Cultural Assumptions. Journal of the American Medical Women's Association. 52(1): 28-29.

Class Split in half for remaining readings
Last name A-M read
6. Ainsworth, C. 2004. Maybe our ovaries do make eggs throughout life. *New Scientist* (2455).
7. Travis, J. 2000. Mom's eggs execute Dad's mitochondria. *Science News* 157(1): 5.

Last name N- Z read
8. Angier N. March 11, 2004. Study of Mice Reproduction Discovers Egg Regeneration. The New York Times, Late Edition (East Coast): A22.
9. Penman, D. Aug 2002.Mitochondria can be inherited from both parents. *The New Scientist*.

Optional:
10. Rapp, Rayna .Refusing Prenatal Diagnosis: The Meanings of Bioscience in a Multicultural World. *Science, Technology, & Human Values,* 23 (1), Special Issue: Anthropological. Approaches in Science and Technology Studies. (Winter, 1998), pp. 45-70. From new school Jstor database http://links.jstor.org/sici?sici=0162-2439%28199824%2923%3A1%3C45%3ARPDTMO%3E2.0.CO%3B2-M . If you enjoy this reading, I suggest Rapp R."

Chapter 9: An Error in Cell Division, or The Power of Positive Diagnosis" *In* Testing Women, Testing the Fetus: the Social impact of Amniocentesis in America. Routledge, NY.20-262. This is anthropological look at amniocentesis.

Websites:

11. **Videos** from Life's Miracle Nova website http://www.pbs.org/wgbh/nova/miracle/program.html
12. **Karyotyping exercise:** University of Utah, Genetic Science Learning Center. (2004). "What can our chromosomes tell us?" http://gslc.genetics.utah.edu/units/disorders/karyotype/
13. **Human Development (optional)** http://www.erin.utoronto.ca/~w3bio380/lecturesFrameset2.htm
14. **Prenatal Genetic Test Analyzes Fetal Cells** http://www.hhmi.org/news/kan.html
15. **What to expect: New Tests for genetic abnormalities: http://www.whattoexpect.com/pregnancy/pregnancy-health/prenatal-testing/nuchal-translucency.aspx**

Oct 1 Narratives of Sex and Gender Stereotypes- Please note that reading will be modified

In Class Activity 3: Chromosomes (1-4)

HW#5 Due: Abnormal / Normal? Essay

Since sex determination involves chromosomes, what does this mean when we come to realize the genes on these chromosomes are responsible for the development of sexual phenotypes and that sex is really a sliding scale. Isabel Rossilini's award winning series "Green Porno" has a short sequence titled "Seduce Me"; note her description of a reimagined Noah's ark based on a new view of sexual roles in nature. Who makes the choices for the next generation; individuals, societies, or nature?

In Class Video: Rossilini, I. Noah's Ark. Seduce Me Segment 2.
http://www.sundancechannel.com/series/seduce-me/videos/noahs-ark-seduce-me-season-2

Reading:

1. **"**The Y chromosome" http://www.hhmi.org/biointeractive/gender/animations.html "Gender Testing of a Female Athlete**"** at the HHMI Biology Interactive site http://www.hhmi.org/biointeractive/gendertest/gendertest.swf
2. Gevisser. 2009. South African Angst. New York Times. September 3, 2009. (2 pages)
3. Nyongo, Tavia. March 2010. The unforgivable transgression of being Caster Semenya. Women and Performance. 20(1): 95-100.
4. Mitochondria and Nuclear Mix. Genetics and Society Forum. This is an editorial from one of my favorite websites The Center for Genetics and Society. See the work that questions how science is presented and communicated when ethical implications are in play. Also the issues of the mitochondrial/ nuclear genome mix.... Jesse Reynolds. Monkeys Mitochondria, and the Human Germline. Bioethics Forum. Sept 18, 2009. http://www.geneticsandsociety.org/article.php?id=4927
5. Fischman, J. April 24, 2014. Reprieve for Men: Y chromosome is not vanishing. Nature Scientific American. http://www.nature.com/news/reprieve-for-men-y-chromosome-is-not-vanishing-1.15103 . This page has a podcast and links to other related articles.

Last Name A-H

6. Miller. 1997. "Whither the Y" *In* Current Perspectives in Genetics. 1997:87-9
7. Graves, J. 2000. Human Y chromosome, sex determination, and spermatogenesis- A feminist view. *Biology of Reproduction.* 63: 667-676.

Last Name I-Q

8. Turner, G. 1996. Intelligence & the X Chromosome. The Lancet. June 29, 1996 347: 1814-15.
9. Edlin. 1990. "Sexism: Prejudice against Women." p. 233 and "Mongolism" p. 246. *In* Human Genetics. Jones and Bartlett Publishing. 1990.
10. Lawrence, P. Jan 2006. Men, women, and ghosts in science. PLOS Biology. http://biology.plosjournals.org/perlserv?request=get-document&doi=10.1371/journal.pbio.0040019

Last Name R-Z

11. Visit http://www.onlineethics.org/CMS/edu/precol/scienceclass/sectone/cs5.aspx and review XYY case study: the case of a criminal with XYY and the subsequent media hype regarding the Y chromosome and aggression.
12. Suzuki and Knudson. "Chapter 6 Blaming Crime on Chromosomes" In Genethics. Harvard University Press 1989. 123-141

Optional Reading

13. Genetics Review Group.1995. One for a boy, two for a girl? *Current Biology* **5**:37-39. This article is a bit more advanced but reviews how sex is determined in many organisms.
14. Graves, J. (2005). Recycling the Y chromosome. *Science*. 307(5706): 50-51. This is more difficult.
15. Do genes play a role in determining whether a man is gay or heterosexual? Medical Study News, January 31, 2005. http://www.news-medical.net/?id=7585
16. Barres, B.(July2006). Does gender matter? Nature. 442:133-136.

Week 7: Classical Genetics: Mendel and McKusick

As scientific advances lead to new technologies that allow us to have greater and greater resolution of scale, genetics becomes fractionated into classical and molecular, deductive/mathematical and empirical/inductive, theoretical and applied. What was the basis of Mendel's work, and how does it play out in social policy making that dates as far back to Victor McCusick who was also involved with the HeLa cell line? How close did Aldous Huxley come to imagining a Brave New World? How on target was Diego Rivera's Man the Controller mural in which man is depicted as controller of the genetics of livestock, agriculture, infectious agents and ultimately family planning in humans and why did the Rockefeller's destroy the original mural "Man at the Crossroads Looking with Hope and High Vision to the Choosing of a New and Better Future." in NYC?

Oct 6 McKusick and the Pedigree

Art: Ellen Levy Culture in Mendel's Garden
http://www.genomenewsnetwork.org/articles/05_02/mendels_garden_art.shtml
Art: Rivera, Diego. 1934. Man Controller of the Universe.
http://en.wikipedia.org/wiki/Man,_Controller_of_the_Universe and http://www.abcgallery.com/R/rivera/rivera46.html
Palacio de Belles Artes. Mexico City. Mexico.
Art: Kahlo, Frida. 1936. My Grandparents and I. MOMA Collection.
http://www.moma.org/collection/object.php?object_id=78784
Art: Google Honors Mendel on July 20, 2011. http://biocreativity.wordpress.com/2011/07/20/salute-to-gregor-mendel-and-his-peas-via-google-logo/

Reading:

1. **HH**: Chapter 3, Transmission of Genes from Generation to Generation,
2. INTERACTIVE: http://www.sumanasinc.com/webcontent/animations/content/mendelindassort.html
3. Edlin. "The Mysteries of Mendel's Experiments." in Human Genetics. Jones and Bartlett Publishing. 1990. pp. 14-15.
4. Goodman, Health and Lindee. S. 2003. "Provenance and the Pedigree: Victor McKusick's Fieldwork with the Old Order Amish." *In* Genetic Nature/ Culture: Anthropology and Science Beyond the Two-Culture Divide. Eds Goodman, Heath and Lindee. University of California Press: 41-57.
5. Trey. 2012. Genomes Are Us Blog Post on Non Traditional Families and the Pedigree http://www.personalgenomics.us/

Oct 8 Mendel and His Famous Peas

HW#6 Due: What if Mendel Had Different Results?

Reading:

1. **HH**: Chapter 3, Transmission of Genes from Generation to Generation and in 7th edition begin to skim Chapter 5
2. Ridley, M. "Disease" in Genome: an Autobiography of a Species in 23 Chapters. Perennial Press. 2000: 136-146.
3. Edlin. "A Hereditary Disease and American History." p. 256-257. Human Genetics. Jones and Bartlett Publishing. 1990. This article is about Porphyria.
4. Cartwright. "Queen Victoria and the Fall of the Russian Monarchy." In Disease and History. 1972. Barnes and Noble Books. pp. 167-196.
5. Review this interactive Blood Type website – it is quite extensive so choose what interests you **http://www.life.rmit.edu.au/mls/subjects/abo/resources/directory.htm**

6. **If time allows we will conduct this activity on testing Blood Type**
   http://chroma.gs.washington.edu/outreach/genetics/sickle/sickle-bean.html

HW #7 and Midterm NEXT WEEK CHALLENGING: COME TO EXTRA OFFICE HOURS THIS WEEK (Wednesday at 5:30pm and second time TBD)

WEEK 8 Non Mendelian Inheritance

Oct 13: NonMendelian Inheritance: Complex Traits.
As scientific experimentation ventured into the unknown, more complex inheritance patterns were explained. Today we know that most human traits, especially for behaviour are non-mendelian in their inheritance, providing a good deal of complexity, and requiring much larger sample sizes than the traditional pedigree analysis can provide. Yet all genomic studies build from the pedigree and the classical approach. Sergy Brin, the co founder of Google recently told his story of inheritance and two approaches to identifying genes associated with Parkinsons. REad his story in Wired and pay close attention to the graphics.
HW #7 DUE: Genetic Crosses and Pedigree : These are difficult so set aside one week to complete
Readings

1. **HH**: Chapter 4 and 5 in the 9th edition, and chapters on pedigree analysis and complex traits or non mendelian inheritance in all other editions.
2. Goetz, T. July .2010. Sergey's Search. Wired Magazine. 18 (07) 106-113, 138-140. http://www.wired.com/magazine/2010/06/ff_sergeys_search/

Oct 15: MIDTERM EXAM Midterm Exam: 2.5 hours please come early or stay late.

NOTE: For the remainder of the course will use the packet under Resources titled. Genetics Handout Part II.

WEEK 9 DNA

Oct 20: DNA Carries the Information

What might seem unbelievable now is that in the beginning, many scientists had their money on protein being the responsible molecule for the inheritance of traits from generation to generation. In these readings we retrace the seminal experiments that made scientists stop and question their assumptions. A real paradigm shift occurred when DNA was identified as the hereditary material. As you read and view these experiments, try on the hat of scientists and trace the scientific method. Be prepared in class for being responsible for providing a flow chart for the three major experiments that brought this discovery home (Griffiths, Avery/Macleod/Mc Carty, and Hershey/Chase. Consider then the role of female at this time in biology; how were female scientists recognized for their contributions?
In Class DNA ACTIVITY
Sign up for Semester Projects Presentations: Please come to class with your planners and prior disc with partner
Art: Wyllie O Hogan. Rosalind Franklin. You Tube 2 minutes. Reviews Franklin's work through art to raise awareness and funds for ovarian cancer. http://www.youtube.com/watch?v=A2GQDU67ink
News: Happy Anniversary Where's All the Women? http://www.youtube.com/watch?v=U7Be6lNRGnI&feature=relmfu
Reading:

1. **HH:** Chapter 8, 7th edition 178-183**,** or 4th edition 196-201
2. **Visit:** http://www.dnaftb.org/dnaftb/. Select molecules of Genetics icon, then select section 17 read the front page and click on menu up top for animation, and the walk through of interactive experiments, problems, and optional video (Clip 5 explaining the resistance to the dogma). Then click on section 18 from the right hand frame and only read the front page.

3. **Visit** http://glencoe.mcgraw-hill.com/sites/9834092339/student_view0/chapter14/hershey_and_chase_experiment.html to view an animation of the Hershey Chase Experiment.

Oct 22 : Nobel Prize for Two Guys: One Man and One Woman go Unrecognized/ Doubling the Double Helix

A dogma is something so central it is considered a belief system. Why are the processes of transcription and translation considered a dogma? How do retroviruses turn this around? How does the DNA code get converted into the 20 amino acid protein code? What is meant by the terms template and non-template strands? Templates for what? Used by what enzyme and how are they recognized by the RNA making and protein machinery? What cell structures and spaces are required for these processes? What would happen if there were problems in the structures or sequencing of the processes? How might infectious agents or cancer cells hijack these processes and to what end; what do they need? Think back to McPhail's viral metaphor paper from the first weeks of class and cell division control.

SP #3: Annotated Bibliography, First Page, Outline, Refshare, and Updated Progress Report

Video of Watson from DNA

In Class Activity #4: DNA replication to prep Use Visual Handout on Molecular Genetics and this link http://www.sumanasinc.com/webcontent/animations/content/meselson.html

Reading:

1. **HH:** Chapter 8, 7th edition 184-197, or 4th edition 202-215
2. Watson, J. Finding the Secret of Life. Classic and Modern Readings in Biology. p26-31. Reprinted from Watson, The Double Helix and *Nature*, vol 171, pp 737-738.
3. Elkin, Lynne. March. 2003. Rosalind Franklin and the double helix. Physics Today. 42-48
4. Watson, J. "Succeeding in Science: Some Rules of Thumb" Reprinted from Watson, *Science*, 261, 1993:1812-1813.
5. Lindee S. April 13, 2003. Watson's World. . *Science*, 300 (35618): 432-434.
6. Crick, F.1974. The Double Helix: A Personal View. *Nature*, 248:766-69.Luminaries in Chemical Sciences. 81-82
7. Articles about James Watson: IQ and and Race. http://topics.nytimes.com/top/reference/timestopics/people/w/james_d_watson/index.html?inline=nyt-per
8. Harmon, A. November 11, 2007. In DNA Era, new Worries About Prejudice. NY Times. http://www.nytimes.com/2007/11/11/us/11dna.html
9. NEWS FLASH: Richards, Sabrina. Sept 13, 2012. DNA with a Twist. DNA Supercoil Structures reviewed with VIDEO LINK http://the-scientist.com/2012/09/13/dna-with-a-twist/ Video by Marijn van Loenhout, courtesy Cees Dekker lab TU Delft
10. NEWS FLASH: Oct 4, 2012, EMBO REPORTS. No Evidence of 30nm Chromatin Fibres in the Mouse Genome. Important work that highlights the need for chromatin to be compacted but accessible for the 80% of the genome that codes for regulatory DNA sequences responsible for epigenetic control.
11. **INTERACTIVE:**
    a. Visit http://www.pbs.org/wgbh/nova/genome/dna.html# and take the journey into DNA which will help you think about scale and relative location
    b. Visit http://www.pbs.org/wgbh/nova/photo51/ to learn about Rosalind Franklin's contribution and take a close look at the X-ray image.
    c. Visit the history project on Linus Pauling and his anti war activism and how that might have prevented him from discovering the structure of DNA. http://osulibrary.oregonstate.edu/specialcollections/coll/pauling/dna/narrative/page14.html
    d. **http://www.biologycorner.com/APbiology/DNA.html** Important good site for general learning of all things...the DNA replication is really good

WEEK 10 Central Dogma : Structures Functions and Variable Phenotype

Oct 27 From DNA to Protein:

Art: Mara Haseltine's Waltz of the Polypeptides installation http://www.calamara.com/archives/large-scale-sculpture/la-boheme/

Reading:

1. **D&N:** Chapter 4 and use the website http://www.dnaftb.org/dnaftb/29/concept/ review sections 31- 37
2. **HH:** Chapter 9: Gene Expression and Gene Regulation
3. Visit the DNAinteractive website (DNAi) and click on "Reading the Code" and then click on "Putting it altogether" and then select the ribosome making a protein animation…. DO THIS it will help immensely (notice that the amino acid on the left has selection buttons. http://www.dnai.org/a/index.html
4. Visit the Molecular Processes site and click on transcription , translation, mRNA processing etc. http://vcell.ndsu.nodak.edu/animations/transcription/index.htm

TUESDAY OCT 28: SP #4 DUE: SCHEDULED MEETING WITH KATAYOUN: SIGN Up for A TIME To REVIEW PROGRESS REPORTS WITH YOUR PARTNER- 1 hour.

Oct 29 Regulating Protein Activity: When, Where, and How Much

HW #8 DUE: Molecular Genetics Due

Red Light … Green Light: Regulation of Protein Activity

As cells respond to environmental cues, they make decisions about which proteins to make where and in what quantity. Most importantly the system has to make a decision about permanent versus transient changes. In the early part of the course we introduced the concept of epigenetics as a means for cells to turn off whole regions of genetic information that may not be needed for a specific cell type, or cell stage (embryonic versus adult versions of proteins). But what of those proteins that we need a little at some point and then the ability to shut down production just as quickly? Here we review the complex systems that can allow cells to remain dynamic in their environments, tweaking protein synthesis on a need to have basis. How do cells decide which genes to turn on and off to make specific proteins… what are the molecular players involved? How can environmental molecules fiddle with this process; environmental toxins, diet, stress etc.?Think back to the cell structures and their functions ? How can we control gene regulation? What role does the micro and macroenvironment play?

Animations of TXN, TLN and Lac operon regulation

Reading:

1. **D&N:** Chapter 4 and use the website http://www.dnaftb.org/dnaftb/29/concept/ review sections 31- 37
2. **Eukaryotic Gene Regulation:** Eukaryotic Gene Regulation: HHMI Lens protein: http://www.hhmi.org/biointeractive/gene-switch
3. **Prokaryotic Lac Operon: View these website in sequenced order:** Virtual Cell Lac Operon http://www.youtube.com/watch?v=oBwtxdI1zvk note the critique in the comments on allolactose then http://www.sumanasinc.com/webcontent/animations/content/lacoperon.html and then visit this one for more info http://highered.mcgraw-hill.com/sites/dl/free/0072835125/126997/animation27.html
4. **View this website** to understand the RNA processing event http://www.sumanasinc.com/webcontent/anisamples/molecularbiology/mRNAsplicing.html
5. **View this website** and select the Proteins and Complexity 6-minute video sequence from the program Cracking the Code of Life by NOVA http://www.pbs.org/wgbh/nova/genome/program.html
6. **Visit this website and** click on : Rockefeller UniversityOffice of Communications and Public Affairs 2002. How Tiny Machines Turn Genes On. http://www.rockefeller.edu/interactive/roeder/gene_expression.swf
7. **Visit this website and** click "Silence of the Genes" http://www.rockefeller.edu/interactive/allis/silence_movie.html (try to think big picture and imagine when and why your cells would use Trap mediator to make fat cells and how this step leads to the production of fat cells).
8. **This website reviews mosaicism due to X Inactivation** Histone Silencing and Mosaicism. Text by Joseph Bonner and Cathy Yarbrough, Convept and Programming by Paul Smith. Art Direction,d design and Illustration by Ann Sappenfield. The Rockefeller University Office of Communication and Public Relations. 2004. http://www.rockefeller.edu/interactive/allis/allis_histone_11.swf

Optional Articles:

9. Simons, S. 1996. Environmental Estrogens: Can two "alrights" make a wrong? 272:1451
10. Abate, T. 2001. Human Genome Map Has Scientists Talking About the Divine. San Francisco Chronicle. Feb 19. B1. http://www.arn.org/docs/news/genome021901.htm
11. Horgun. J. November 26, 2004. Do Our Genes Influence Behavior?Why We Want to Think They Do.51(14):B12. The Chronicle of Higher Education. http://chronicle.com/weekly/v51/i14/14b01201.htm
12. Parens, E. (Editor). Jan-Feb2004. Special Supplement to the Hastings Center Report: Genetic Differences and Human Identities. http://www2.unil.ch/determinismes/H%E9ritabilit%E9/genetic_differences_and_hum.pdf

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WEEK 11: Proteins: Case Studies of Epistasis, Penetrance and Expressivity

Nov 3 : Proteins: Structure Dictates Function

Review HW #8. Act out protein folding and Protein Activity Questions

HW#9 DUE: Gene Regulation Due: (Pictures and Text).

Art: Julian Voss Andreas. Heart of Steel. 2005, Weathering steel and glass, height: 5' (1.60 m), location until Fall 2007: 1st Street/"A" Avenue, City of Lake Oswego. http://en.wikipedia.org/wiki/File:Heart_of_Steel and Artist statement http://www.julianvossandreae.com/Work/protein7gallery/PressRelease.html

Reading:

1. **HH:** Chapter 10. From Proteins to Phenotypes . This chapter is dense so I will point out what you should focus on. Pay close attention to the introductory vignette on PKU (reminder of Bill and Doug, which one?) and the remaining sections of this chapter on PKU including the boxes. You can skim or skip over the other metabolic disorders in this chapter. Also focus on SCA, and skip the other anemias and thalessemias

Regulation of Protein Activity Questions in Class:

1. At the level of DNA
2. At the level of transcription (see Simons article on Nov 4th)
3. At the level of post txn
4. At the level of post tln

→ Show the Lac Operon Again…. On Interactive Concepts in Biology Media Highlights. You can watch and interact on your own http://www.sumanasinc.com/webcontent/animations/content/lacoperon.html

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Nov 5: Proteins: Mutations and Variance/ Case Studies PKU and SCA

READINGS WILL BE ADJUSTED

Changes at the level of the DNA sequence are considered mutations or polymorphisms and the terminology is always changing. The difference depends on the frequency of variance; if frequent and multiple versions then the term polymorphism is used, and if infrequent and comprises fitness the term mutation is used. But really this is just terrible semantics as new genome association studies point to polymorphisms that can affect fitness.

Notice how Eduardo Kac uses art and religion to communicate the basics of mutation and its effect on making meaning; an interesting metaphor. How can a single change in the DNA sequence be described as dominant or recessive in its effect by simply changing the scale of the observation of phenotype? Why might different races reflect different mutation frequencies; this is the proximate effect but what is the ultimate cause?

Art: Eduardo Kac's Genesis http://www.ekac.org/geninfo2.html

HW# 10 DUE In Class Student presentations of "genetics charts" for two alleles (HbA and HbS) that includes the headings we reviewed (alleles, genotype, phenotype at organismal, cellular, and protein level, outcome, dominant or recessive, etc)

Reading:

1. Thomas, K. and Zarda, B, April 11, 2010 In N.C.A.A., Question of Bias Over a Test for a Genetic Trait. The New York Times.
2. HH Chapter 10 in 10th edition pages 226-230: This entire chapter is good, but dense, Pay close attention to the figures
3. Chamany, K. (draft). Protective Alleles Don't Always Protect Populations. (5 pages)
4. Sankaran, V. et al. 2010. Reversing the Hemoglobin switch. NEJM. 363:2258-2260.
5. Nelson, Alondra. 2011. " Spin Doctors: The Politics of Sickle Cell Anemia" Chpt 4 *In* Body and Soul: The Black Panther Party and the Fight against Medical Discrimination. University of Minnesota Press.MN: 115-152.
6. Use the Genetics Handout of Figures large packet to better understand the types of mutations at different levels.
7. SCA powerpoint posted there under Resources. PPT and Images. Think carefully about the terminology we use to describe mutations at different levels (DNA, Amino Acid, Protein, Cellular Function, Organismal Function). How does what we are measuring affect how we describe mutations?

Optional:

1. Olson, S. Nov 15, 2002. Seeking the signs of selection. Science 298: 1324-25. Discusses the way in which mutations can be selected for by the environment in a direct and indirect way.
2. Visit http://www.nslc.wustl.edu/courses/Bio296A/allen/sicklecell/part4/treatment.html , and review "Political Aspect of Sickle Cell Anemia" and skim the other sections For more background see http://www.nslc.wustl.edu/courses/Bio296A/allen/sicklecell/part1/background.html .
3. Treatment and Politics of Sickle Cell Anemia (Black Panther History). http://www.nslc.wustl.edu/sicklecell/part4/treatment.html

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WEEK 12 CASES: RACE, DISABILITY, or RESILIENCE

Nov 10 : OPEN TOPIC: Either Skin Color or Resilience
SP#5 DUE: 1st Draft Paper, Self Critique, Refshare, updated Progress Report and comments (Portfolio Style)
Sign up for Appts with Kellie to review your Papers next week and the following week.
Sign up for Practice Talks with Katayoun for Nov 18,20, 25, 26, Dec 2,3

Resilience TOPIC

Art: Helen Donnis Keller's Genotype to Phenotype: Helen Heads http://helendonis-keller.com/art/genotypephenotype-project/

Everyone Reads the four articles below on Resilience (telephone game)

1. *Bazelon, E. 2006. A Question of Resilience. The New York Times Magazine. April 30: 54-59. Case study of 5-HTT alleles and GxE.
2. *Holden, C. July 18, 2003.Getting the Short End of the Allele. Science.301 (5631): 291-230.
3. *Bower, B. June 18, 2009. Gene Plus Stress Equals Depression Debate. Science News 176 (2): 10.
4. * Edlin. "Psychoneuroimmunology." p. 319 . Human Genetics. Jones and Bartlett Publishing. 1990. This article is about chemical links between the brain and the immune system.
5. * Young, Ed. April 12, 2010. Dangerous DNA: The truth about the 'warrior' gene. New Scientist. Issue 2275: 34.

Optional Background Reading on Behavioral Genetics

6. **HH:** Read Chapter 4 and Chapter 5 in the 7th edition and pay close attention to concordance and **focus on concepts and general categories rather than memorize specific examples**
7. Baker C. 2000."Chapter 4: How is Genetic Research on Behavior Conducted," in Behavioral Genetics. AAAS. http://www.aaas.org/spp/bgenes/publications.shtml (about 20 pages)- you need to scroll to the bottom of the page for the link.

8. Berkowitz. A. Jan 1996. Our Genes Our Selves. BioScience 46(1):42-51. http://serendip.brynmawr.edu/gen_beh/Berkowitz.html This is a good article about linkage studies and genetic markers for behavior.

Nov 12 FLEXIBLE EUGENICS

Selection of papers using an anthropological and psychological approach to understanding the impact of genetic testing on society and individuals. Think about how different communities with variance adopt very different attitudes towards testing, and how government has become involved in regulating the use of genetic information (first website NGRI).

SP #6 DUE: Peer Critiques Due in your GROUP PAGE and email to KC. File Name format Peer_My last name _of_peer's last name.

Reading:

1. *Tuassig, Rapp, and Heath. "Flexible Eugenics" in Genetic Nature/Culture edited by Goodman, Heath and Lindee. University of California Press. Berkeley. 2003:58-76. Class will be broken into three sections and each group is responsible for reading only one section of this chapter.
2. *Lunzer Kritz and Mazel. Too Much for Too Little: Costly Newborn Tests Fuel Debate on Value. *Washington Post.* July 2, 2002: F1.
3. *Eng et al. 1997. Prenatal genetic carrier testing using triple diseases screening. *JAMA* 278 (15): 1268-1272. (pay close attention to the scientific method)
4. Wachbroit, R. 1998. The Question Not Asked: The Challenge of Pleiotropic Genetic Tests. *Kennedy Institute of Ethics Journal*., 8 (2) : 131-144. http://muse.jhu.edu/journals/kennedy_institute_of_ethics_journal/v008/8.2wachbroit.html
5. * Timmermans, Sara and Mara Buchbinder. Dec 7, 2010. Patients in Waiting: Living Between Sickness and Health in the Genomics Era. Journal of Health and Social Behaviour. 51:408-423. Review in ereserves for 2011.

Websites

Visit the National Genome Research Institute (NGRI) Site on Genetic Discrimination http://www.genome.gov/10002077

Optional:

1. Holtzman, N.Nov 19, 2003 Expanding newborn screening: How good is the evidence? *JAMA*. , 290(19):2606-08.
2. Waisbren et al. Effect of expanded newborn screening for biochemical genetic disorders on child outcomes and parental stress.*JAMA*. November 19, 2003, 290(19):2564-2572.
3. Visit the National Conference of State Legislatures page on newborn genetic screening http://www.ncsl.org/programs/health/screen.htm
4. March of Dimes Map http://www.marchofdimes.com/peristats/tlanding.aspx?reg=99&top=12&lev=0&slev=1
5. Finkelstein, J. April 5, 2004. Protecting genetic privacy: Is a law needed? AMnews http://www.ama-assn.org/amednews/2004/04/05/gvsa0405.htm. An Interview with Francis Collins about legislation and polls on public desires.
6. GINA 2008: The Genetic Information Non Discrimination Act. http://www.genome.gov/24519851

SP# 7 DUE Student Presentations

Presenters should post their images, presentation materials and one article (or your paper) for the class to read the weekend before their presentation under Bb communication- Group Pages- File Exchange. Students should print these materials out and come to class prepared to engage with the presenters. If you would like to schedule a practice talk, please contact me early and schedule it two weeks in advance.

Nov 17 Student Presentations 2
Nov 19: Student Presentations 3
Nov 24 Student Presentations 3
Nov 26: No Class Thanksgiving
Dec 1 Student Presentations 3

Dec 1 Final Exam Review Sessions TBD
Dec 3: Review and Take Home Portion of Final Exam
Dec 8: In Class Portion of Exam (2.5 hours)
Dec 10: SP#8 DUE Portfolios Due and all Extra Credit

Student Papers and Presentations

Throughout the course, you will work towards the development of an academic expository paper 5000-6000 words in length and a formal 30- minute presentation to the class. The paper is written individually and the presentation is done in collaboration with another student who is researching and writing about the same topic. This assignment is progressive and collaborative in terms of peer review, with submission of works in progress every few weeks. Through this practice you will be experiencing the real world steps of scholars in the field who research their work, share their work in progress, receive feedback from peers, and then publish or present their work to a wider audience. See STEPS document Canvas / Semester Project. Remember, student presentations serve five purposes: 1) Help you gain a better understanding of the subject and the appropriate resources; 2) teach you how to be concise and creative during your presentation; 3) provide you with the opportunity to share your findings with the rest of the class; and 4) inform me of the way you prefer information to be presented during class and most importantly 5) Map the major concepts and principles from class to your topic as a way to review for the final exam (gene regulation, mutation, inheritance, social views, epigenetics, etc). You will receive feedback from the class in the form of a critique and these will count towards each student's course grade (yours and theirs). See the Semester Topics Folder on Canvas for a mini bibliography and synopsis of topics, but if none of those interest you, you can explore the following on your own independently.