

GENETIC ENGINEERING IN MEDICINE, AGRICULTURE, & LAW
Winter 2014

Professors Bob Goldberg, John Harada, & C.S. Prakash

**Honors Collegium 70A (UCLA),
Science & Society 70A (UC Davis),
Genetics and Society PLSS 0599 (Tuskegee University)**

LECTURES & GUEST LECTURES: Tuesday & Thursday 3:30-6:00 → La Kretz 120

DISCUSSION SECTIONS: Wednesday 1:00-3:00; 3:00-5:00; & 5:00-7:00 PM → La Kretz 100

REQUIRED TEXTS: *Introduction to Biotechnology, HC70A Edition* (W. J. Thieman & M. A. Palladino)
The Double Helix (J. D. Watson)
Scientific American & Other Articles (handed out in class)

OFFICE HOURS: Friday: 11:30 – 1:30 PM → Terasaki Life Sciences 4121
Phone: 310-825-9093; Email: bobg@ucla.edu

GOLDBERG HC70A WEBSITE: http://www.mcdb.ucla.edu/Research/Goldberg/HC70A_W14/

HC70A UCLA CAMPUS CCLE WEBSITE: <http://www.ccle.ucla.edu>

BRUINCAST: <http://www2.oid.ucla.edu/webcasts/courses/2013-2014/2014winter/hnrs70a-1>

ADMINISTRATIVE ASSISTANTS: Lauren Bowman → 4125 Terasaki Life Sciences 4125
Phone: 310-825-3270; Email: bobglab@mcdb.ucla.edu
Ann Amores → 4125 Terasaki Life Sciences 4125
Phone: 310-825-3270; Email: bobglab@mcdb.ucla.edu

TEACHING FELLOW SECTIONS & OFFICE HOURS:

1-3 – Mike Lyons (lyons24@ucla.edu)	Office Hrs: Thursday 9:00-11:00 AM → Hershey 318
3-5 – Reece Fenning (reecefenning@ucla.edu)	Office Hrs: Monday 2:00-4:00 PM → Hershey 318
5-7 – William Barshop (wbarshop@ucla.edu)	Office Hrs: Tuesday 12:30-2:30 PM → Hershey 318

LECTURES: HC70A lectures are very interactive, and in-class scientific “experiments” highlight major genetic engineering concepts. Lectures are webcasted to help you review concepts at your own pace.
Note: Attendance in lecture is required.

GUEST LECTURES: Guest speakers have been invited to highlight the real-life societal impacts of DNA and genetic engineering. Note: Attendance in guest lectures is required.

DISCUSSION SECTION: Discussion Section is taught as an Undergraduate Seminar in Socratic style, and focuses on articles that relate to the history, applications, and societal impacts of genetic engineering. You must read the articles and text background material before discussion section and come prepared to participate in a thoughtful and interactive manner. Focus your reading around four questions: (1) What is the overall conceptual issue, or question, being addressed? (2) What are the technologies being discussed? (3) What is the significance of the technology, and how does it apply to real-life situations? (4) What ethical issues arise, if any, as a consequence of new technology? A Discussion participation grade of up to 100,000 points will be assigned at the end of the quarter. Note: Attendance in discussion section is required.

QUIZZES: A **Take-Home Quiz** will be handed out each week, and will also be posted on the class website. The take-home quiz focuses on the reading material and concepts covered in both discussion and lecture for that week. Quizzes will count 25,000 points each. Note: You may work together in groups in order to solve the quiz

problems. However, each of you must learn how to solve the quiz problem, hand in your own quiz, and be prepared to answer quiz questions in Discussion or Lecture. Quizzes are due by 4 PM the following Monday in Terasaki Life Sciences 4121.

CLASS RECEPTIONS & LUNCH WITH THE PROFESSOR: There will be a catered all-class reception for each guest speaker immediately following their Thursday lecture. This will give you an opportunity to interact with the speakers who are experts in their chosen fields. I will also take groups of students to lunch throughout the quarter, and will be a unique experience! Check the group list that will be handed out in class for the week and day that you are scheduled for "lunch with the professor."

DOUBLE HELIX REPORT: You will write a short report on *The Double Helix* by J. D. Watson that will count 50,000 points. Guidelines will be handed out in class. **The *Double Helix* Report is due at the beginning of class on Tuesday, January 21 (Week 3)**

EXAMS: Exams include a **Take-Home Exam** and **Two All-Class Oral Exams**. Take-Home Exam questions will be handed out in class during Week 4 and will count 400,000 points. The mid-term oral exam will cover questions on the Take-Home Exam and Quizzes, and will count 100,000 points. Final Oral Exam questions will be handed out in class during Week 9 and will count 150,000 points. The Exam Schedule is:

Take-Home Exam: Due Tuesday, February 11 at the beginning of class (Week 6)

All-Class Mid-Term Oral Exam: Tuesday, February 11 (Week 6)

All-Class Final Oral Exam: Thursday, March 13 (Week 10)

GRADING: You will be able to earn **ONE MILLION regular points** and a number of **BONUS POINTS** during the quarter (e.g., lab report). **Your grade will be based on 1,000,000 points**, although you have the potential for earning more than 1,000,000 points. Regular points will be divided as follows:

	Total Points	% Grade
<i>Double Helix</i> Report	50,000	5
Discussion Quizzes (8)	200,000	20
Discussion Participation	100,000	10
Take-Home Exam	400,000	40
Mid-Term Oral Exam	100,000	10
Final Oral Exam	150,000	15
TOTAL	1,000,000	100

The following guidelines will be used to assign grades: **A** (>90%), **B** (80-89%), **C** (70-79%), **D** (60-69%), **F** (<60%). Your grade will be assigned using the following formula:

$$\% \text{ Total Points} = \frac{[(\text{Regular points} + \text{Bonus points})] \times [100]}{[(1,000,000)]}$$

DATE	LECTURE & DISCUSSION SCHEDULE (WEEKS 1-4)
1/7	Lecture 1: <i>The Age of DNA: What is Genetic Engineering - Part One</i> Short Films: <i>Designing Life; Resurrecting the Extinct</i> Demonstration: Isolating "Your" DNA
1/9	Films: <i>Gene Engineers; Playing God</i> Beginning of Class Reception
DISCUSSION 1:	Scientific Origins of Genetic Engineering & Biotechnology-1: <i>DNA Cloning: A Personal View After 40 Years; Manipulation of Genes; The Recombinant DNA Debate</i>
1/14	Lecture 2: <i>The Age of DNA: What is Genetic Engineering - Part Two</i> Demonstration: Classical Genetic Engineering: Crop Origins Short Film: <i>History's Harvest: The Beginnings</i> DOUBLE HELIX REPORT QUESTIONS HANDED OUT
1/16	Film: <i>Race for the Double Helix</i>
DISCUSSION 2:	Scientific Origins of Genetic Engineering & Biotechnology-2: <i>Useful Proteins from Recombinant DNA; Gilbert Nobel Lecture</i>
1/17	Lunch With the Professor 1
1/21	Lecture 3: <i>What Are Genes & How Do They Work: Part One</i> Demonstration: Bacteria "Cloning" BACTERIA "CLONING" GUIDELINES HANDED OUT DOUBLE HELIX REPORT DUE
1/23	Speakers: Channapatna Prakash, PhD: <i>Engineering Crops For the Developing World</i> ; Alan McHughen, PhD: <i>GMOs – What's All the Fuss About?</i> All-Class Reception
DISCUSSION 3:	Crop Genetic Engineering: <i>Transgenic Crops; Are Genetically Engineered Foods Evil? Oxford Farming Lecture</i>
1/28	Lecture 4: <i>What Are Genes & How Do They Work: Part Two</i> Short Film: <i>Kerry Mullis and PCR</i> Demonstration: Making Your Own DNA Fingerprint! BACTERIA "CLONING" REPORT DUE
1/30	Speaker: Emily Anthes, M.A.: <i>"Frankenstein's Cat – What the Future Holds For Engineering Life"</i> TAKE-HOME EXAM QUESTIONS HANDED OUT All-Class Reception
DISCUSSION 4:	How to Mark Your Genes: <i>Chromosome Mapping With DNA Markers; Keeping Your Genes Private; The DNA Dilemma; Fetal DNA Sequence; DNA Sequencer Raises Doctor's Hopes For Personalized Medicine</i>
1/31	Lunch With the Professor 2

DATE	LECTURE & DISCUSSION SCHEDULE (WEEKS 5-9)
2/4	Lecture 5 – How Are Genes Cloned & Engineered: The Hemophilia Story Demonstration: DNA Gel Electrophoresis
2/6	Movie: <i>Conviction</i>
DISCUSSION 5:	DNA & The Law: <i>When Science Takes the Witness Stand; DNA Goes to Court; CSI Reality</i>
2/7	Lunch with the Professor 3
2/11	UC Davis Students Visit UCLA TAKE HOME EXAM DUE ALL-CLASS MIDTERM ORAL EXAM UCLA & UC Davis Class Reception
2/12	Dinner With UC Davis Students
2/13	Lecture 6: <i>21st Century Genetic Engineering Applications</i>
DISCUSSION 6:	Animal Genetic Engineering: <i>Transgenic Livestock As Drug Factories; The Land of Milk & Honey; FDA Approval of Atrypin; Cloning For Medicine; FDA Approval of Genetically Engineered Salmon; Politics Holds Back Animal Engineers</i>
2/14	Lunch With the Professor 4
2/18	Lecture 7: <i>Age of Genomics-Identifying Individuals Past & Present Using DNA</i> Short Film: <i>Knowledge or Certainty</i>
2/20	Speaker: <i>Pei Yun Lee, PhD: Stem Cells: Promise, Reality, and Conflict</i> All-Class Reception
DISCUSSION 7:	Stem Cells & Genetic Engineering: <i>The Future of Stem Cells; Your Inner Healers; Diseases in a Dish; Pandora's Baby</i>
2/14	Lunch With the Professor 5
2/25	Tuskegee Students Visit UCLA Lecture 8 – Professor John Harada: <i>Human Genetic Engineering & 21st Century Gene Therapy</i>
2/27	Speaker: <i>Michele Evans, MD: In Vitro Fertilization & Genetic Testing</i> UCLA & Tuskegee Class Reception Dinner With Dr. Evans ("Lunch" With the Professor 6)
DISCUSSION 8:	Human Genetic Engineering: <i>Gene Therapy; What Cloning Means for Gene Therapy; Hitting the Gene Off Switch; Articles From Popular Press</i>
3/4	Lecture 9: <i>Science & the Constitution: Regulating Science & GMOs</i> Short Films: <i>Inherit the Wind; Judgment Day</i>
3/6	Film: <i>Extraordinary Measures</i>
DISCUSSION 9:	Genes & Cancer: <i>The Genetic Basis of Cancer; Mapping the Cancer Genome; Gene Therapy & Articles From Popular Press</i>
3/7	Lunch With the Professor 7

<u>DATE</u>	<u>LECTURE & DISCUSSION SCHEDULE (WEEK 10)</u>
3/11	Lecture 10: <i>Science & the Constitution: Who Owns Your Genes?</i>
Discussion 10:	Patenting Genes: <i>Patenting Life; Owning the Stuff of Life; Supreme Court Myriad Patent Ruling; Myriad Patent Case Articles From Popular Press</i>
3/13	FINAL ALL-CLASS ORAL EXAM End of Class Reception

LECTURE & DISCUSSION SECTION TEXT READING:

Note: These chapters review all information related to the topics covered in each lecture and discussion PLUS additional topics. *Concentrate on chapter sections related to lectures and discussion articles.*

Introduction To Biotechnology, Custom HC70A Edition

Lecture 1	Chapters 1 & 3 (pgs. 65-72)
Discussion 1	Chapters 3 (pgs. 65-72)
Lecture 2	Chapters 1 & 3 (pgs. 65-72)
Discussion 2	Chapters 2 & 3 (pgs. 71-88)
Lecture 3	Chapter 2
Discussion 3	Chapters 5 & 9
Lecture 4	Chapters 2 & 3 (pgs. 78-80)
Discussion 4	Chapter 8 (pgs. 203-220)
Lecture 5	Chapter 3
Discussion 5	Chapter 7
Lecture 6	Chapters 4 & 6
Discussion 6	Chapters 6 & 9
Lecture 7	Chapter 3 (pgs. 94-105)
Discussion 7	Chapters 8 (pgs. 232-245) & 10
Lecture 8	Chapters 8 (pgs. 220-227) & 10
Discussion 8	Chapters 8 (pgs. 220-227) & 10
Lecture 9	Chapters 9 & 10 (pgs. 280-283)
Discussion 9	Chapters 3 (pg. 104) & 8 (pg. 206)
Lecture 10	Chapters 9 (pgs. 256-261) & 10 (pgs. 280-283)
Discussion 10	Chapter 9 (pgs. 256-261) & 10 (pgs. 280-283)