

GENETIC ENGINEERING IN MEDICINE, AGRICULTURE, & LAW
Professors Bob Goldberg (UCLA) & John Harada (UC Davis)
Spring 2017

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

TEXT: *Introduction to Biotechnology* (W. J. Thieman & M. A. Palladino, 3rd Edition, 2013)

OFFICE HOURS: Thursday: 1:30 – 2:30 PM → Terasaki Life Sciences Building 4121
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GOLDBERG HC70A WEBSITE: http://www.mcdb.ucla.edu/Research/Goldberg/HC70A_Sp17/

HC70A CCLE WEBSITE: <https://ccl.e.ucla.edu/course/view/17Sp-HNRS70A-1>

BRUINCAST: <http://www2.oid.ucla.edu/webcasts/courses/2016-2017/2017spring/hnrs70a-1>

COURSE ADMINISTRATOR: Lauren Bowman → Terasaki Life Sciences Building 4125
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DISCUSSION COORDINATOR: William Barshop – wbarshop@ucla.edu

UNDERGRADUATE ASSISTANTS: Helen Li (helenli8101@gmail.com) & Pierce Ford (piercef@g.ucla.edu)

LECTURES: HC70A lectures are interactive and in-class scientific “experiments” highlight important genetic engineering concepts. ***Note: Attendance in lecture is required.***

GUEST LECTURES: Guest speakers highlight the societal impacts of genetic engineering. ***Note: Attendance in guest lectures is required.***

CLASS RECEPTIONS: There will be a catered all-class reception for each guest speaker immediately following their lecture, providing an opportunity to interact with guest speakers.

DISCUSSION SECTIONS: Discussion Sections are taught as undergraduate seminars in a Socratic style, and focus on articles that relate to the history, applications, and societal impacts of genetic engineering. Focus your reading around four questions: (1) What is the overall scientific question being addressed? (2) What are the technologies being discussed? (3) What is the significance of the technology? (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** that focuses on the concepts covered in discussion and lecture will be handed out each week after discussion section. Quizzes will count 25,000 points each. **Quizzes are due by 6 PM the following Monday in Terasaki Life Sciences 4121.**

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 8 and will count 150,000 points. The Exam Schedule is:

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

All-Class Mid-Term Oral Exam: Thursday, May 11 (Week 6)

All-Class Final Oral Exam: Thursday, June 8 (Week 10)

COURSE GRADING: You will be able to earn **ONE MILLION regular points** and a number of **BONUS POINTS** during the quarter. **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:

Assignment	Total Points	% Grade
Lecture Attendance	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:

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

DISCUSSION GRADING CRITERIA: Each Discussion is worth 10,000 points. Points will be assigned as follows:

Grading Criteria	Total Points
Attend Discussion	2,500
Participate in Discussion	2,500
Demonstrate You Read Assigned Articles	2,500
Demonstrate Thorough Understanding of Article Concepts	2,500
TOTAL	10,000

DATE	LECTURE & DISCUSSION SCHEDULE (WEEKS 1-6)
4/4	Lecture 1: <i>The Age of DNA: What is Genetic Engineering - Part One</i> Demonstration: Isolating DNA
4/6	Film: <i>Playing God</i>
DISCUSSION 1:	<i>What Do You Think About GMOs?</i>
4/11	Lecture 2: <i>The Age of DNA: What is Genetic Engineering - Part Two</i> Demonstration: Classical Genetic Engineering; Crop Origins
4/13	Film: <i>Race for the Double Helix</i>
DISCUSSION 2:	Origins of Genetic Engineering-1: <i>Manipulation of Genes; The Recombinant DNA Debate</i> Demonstration: DNA Gel Electrophoresis
4/18	Lecture 3: <i>What Are Genes & How Do They Work: Part One</i>
4/20	Film: <i>Extraordinary Measures</i>
DISCUSSION 3	Origins of Genetic Engineering-2: <i>Useful Proteins from Recombinant DNA</i> Lab Demonstration: Bacteria "Cloning"
4/25	Lecture 4: <i>What Are Genes & How Do They Work: Part Two</i> Demonstration: Making Your Own DNA Fingerprint! BACTERIA "CLONING" REPORT DUE
4/27	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 TAKE-HOME EXAM QUESTIONS HANDED OUT
DISCUSSION 4:	Genetic Engineering Crops & Farm Animals: <i>Are Genetically Engineered Foods Evil?; Transgenic Livestock As Drug Factories; GM Salmon Declared Fit For Dinner Plates</i>
5/2	Lecture 5 – <i>How Are Genes Cloned & Engineered: The Hemophilia Story</i>
5/4	Speaker: Harry Klann, Supervising Criminologist, LAPD DNA Unit: <i>DNA Forensics & The Law</i> All-Class Reception
DISCUSSION 5:	DNA & The Law: <i>When Science Takes the Witness Stand; DNA Goes to Court</i>
5/9	ALL-CLASS MIDTERM ORAL EXAM TAKE HOME EXAM DUE UC Davis Students Visit
5/11	Lecture 6 – <i>A 21st Century Genetic Engineering Revolution</i>
DISCUSSION 6:	How to Mark Your Genes: <i>Chromosome Mapping With DNA Markers; Genomics For the People</i>

DATE	LECTURE & DISCUSSION SCHEDULE (WEEKS 7-10)
5/16	Lecture 7 – Age of Genomics: Three Parent Babies, Human Origins, & Race Short Film: Knowledge or Certainty
5/18	Speaker: Michele Evans, MD: In Vitro Fertilization & Genetic Testing All-Class Reception
DISCUSSION 7:	The CRISPR Revolution: The DNA Revolution; The Gene Hackers
5/23	Lecture 8 –Professor John Harada: Human Genetic Engineering FINAL ORAL EXAM QUESTIONS HANDED OUT
5/25	Speaker: Pei Yun Lee, PhD: Stem Cells: Promise, Reality, and Conflict All-Class Reception
DISCUSSION 8:	Human Genetic Engineering: Gene Therapy; Gene Therapy’s Second Act
5/30	Lecture 9: Science & The Law: Regulating Science & GMOs
6/1	Speaker: Daisy Robinton: The Future of Genetic Engineering & Health All-Class Reception
DISCUSSION 9:	Synthetic Biology –Future of Medicine: Transformers; What’s the Point of Streamlining Nature?; Scientists Hold Meeting To Consider Creating a Synthetic Human Genome
6/6	Lecture 10: Science & The Law: Who Owns Your Genes?
6/8	FINAL ALL-CLASS ORAL EXAM End of Class Reception
DISCUSSION 10:	Patenting Genes: Test-Tube Life: Reg. US. Pat. Off.; Owning the Stuff of Life; Justices, 9-0, Bar Patenting Human Genes Patent Ruling; CRISPR Patent Fight Now a Winner-Take-All Match; Harvard & MIT Scientists Win Gene Editing Patent Fight

TEXT READING ASSIGNMENTS:

Note: No textbook is perfect and follows the lecture sequence of every class – including HC70A! Your textbook contains most, but not all, of the conceptual information covered in HC70A lectures and discussion sections – but not in the same order. Because genetic engineering is changing at warp speed, several concepts presented in HC70A are new, and were discovered only within the past year or so. Reading material handed out in Discussion Section will cover these new concepts. *The textbook reading reviews and complements information related to the topics covered in most lectures and discussions. Study the information presented in these reading assignments, as it will help you understand the major concepts presented in HC70A and solve problems on the exams and quizzes.*

Introduction to Biotechnology, 3rd Edition (2013)

Lecture 1	Chapters 1 & 3 (pgs. 58-69)
Discussion 1	No Text Reading
Lecture 2	Chapters 1 & 3 (pgs. 58-69)
Discussion 2	Chapter 3 (pgs. 58-69)
Lecture 3	Chapter 2
Discussion 3	Chapters 2, 3 (pgs. 69-84), & 5 (pgs. 133-135)
Lecture 4	Chapter 2
Discussion 4	Chapters 6, 7 (pgs. 175-187); 12, & 13)
Lecture 5	Chapters 3 & 11 (pgs. 263-272; pg. 278)
Discussion 5	Chapter 8
Lecture 6	No Text Reading
Discussion 6	Chapter 11 (pgs. 263-272; pg. 278)
Lecture 7	Chapters 1 (pgs. 15-16), 3 (pgs. 88-99), & 11 (pgs. 270-271)
Discussion 7	No Text Reading
Lecture 8	Chapter 11 (pgs. 280-287)
Discussion 8	Chapter 11 (pgs. 280-287)
Lecture 9	Chapter 12
Discussion 9	No Text Reading
Lecture 10	Chapter 12
Discussion 10	Chapter 12