

Honors Collegium 70A
Genetic Engineering In Medicine, Agriculture, & Law
Sponsored by the HHMI University Professors Program

Dr. Bob Goldberg
Winter 2003

LECTURE & FILMS: Tuesday & Thursday 3:00-5:30 Life Sciences 2142

DISCUSSION SECTIONS: Wednesday 2-4 (1A-Mike) & 4-6 (1B-Malik) Life Sciences 2320

REQUIRED TEXTS: *DNA Technology* (I. E. Alcamo)
The Double Helix (J. D. Watson)
Scientific American Articles (see bibliography on page seven)

OPTIONAL BOOK: *Rosalind Franklin* (Brenda Maddox)

OFFICE HOURS: Thursday 1-3 PM; Friday 4-6 PM Life Sciences 2832
Phone: 825-9093 Email: bobg@ucla.edu

GOLDBERG LAB/TEACHINGWEB SITE: <http://www.mcdb.ucla.edu/Research/Goldberg>

CLASS WEB SITE: <http://www.lsic.ucla.edu/classes/winter/hnrs70a.html>

ADMINISTRATIVE ASSISTANT: Greta Nelson, Life Sciences 2835 (825-3270/gnelson@lifesci.ucla.edu)

TEACHING ASSISTANTS: Mike Ferry (msferry@ucla.edu) & Malik Francis (mfrancis@mednet.ucla.edu)
Office Hours: Mike (Monday 10-1) **Malik** (Tuesday 11-2)
Life Sciences 2835 Phone: 825-3270

LECTURES: Lectures are recorded digitally and can be viewed on the class web site.

FILM DISCUSSIONS: Films are an integral aspect of the course and **attendance at the Thursday film section is required**. The films serve as a focal point for discussions on the social consequences of genetic engineering technology and science in general. Note: If you miss more than two film discussions your final grade will be lowered by one letter.

DISCUSSION SECTION: Discussion Section will be taught as an Undergraduate Seminar and will focus on Scientific American articles and plays/debates that simulate "real-life" situations that use genetic engineering technology. The articles/plays/debates will introduce you to important new concepts and will teach you how to read and think about science. Focus your reading around four questions: (1) What is the question being addressed by the article? (2) What are the technologies/approaches being discussed? (3) What is the significance of the technology and how does it apply to real-life situations? (4) What ethical issues arise as a consequence of the new technology?

At the end of each Discussion Section you will be given a **take-home** quiz that focuses on the articles read for that Discussion. **Each quiz is due by midnight in LS 2832 on the Friday following Discussion Section**. The quizzes will count 25,000 points each. **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 and hand in your own quiz.** In addition to points earned on the quizzes, a Discussion participation grade of up to 100,000 points will be assigned at the end of the quarter by your Teaching Assistant.

ESSAY: You will write an essay on *The Double Helix* by J. D. Watson. The essay will count 100,000 points and will be graded for content, style, and grammar. Essay guidelines will be handed out in class.

The Double Helix Essay is due at the beginning of class on Tuesday, January 28 (Week 4)

Honors Collegium 70A Winter 2003

Page Two

CLASS PROJECT: The **entire class as a group** will write, produce, and perform in a videotaped movie concerning one aspect of Genetic Engineering discussed this quarter. The purpose of this project is to encourage class interaction, create a useful learning device, and **have some fun**. Movie guidelines will be discussed in class. The Teaching Assistants must approve the movie topic and concept.

The movie will be shown to the entire class on **Thursday, March 13 (Week 10)** and will count 50,000 points.

EXAMS: Exams include a **Take-Home Exam** and an **All-Class Oral Exam**. Take-Home Exam questions will be handed out in class during Week 5. The Oral Exam questions will be handed out on the last day of class (March 13). The Take-Home Exam will count 350,000 points and the All-Class Oral Exam will count 150,000 points. The Exam Schedule is:

Take-Home Exam: Due Tuesday, February 25 at the beginning of class (Week 8)

All-Class Oral Exam: 8-11 AM, Tuesday, March 18, Life Sciences 2142 (Week 11)

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

	<u>Total Points</u>	<u>% Grade</u>
Essay	100,000 points	10%
Movie Project	50,000 points	5%
Discussion Quizzes	250,000 points	25%
Discussion Participation	100,000 points	10%
Take-Home Exam	350,000 points	35%
<u>All-Class Oral Exam</u>	<u>150,000 points</u>	<u>15%</u>
TOTAL	1,000,000 points	100%

I DO NOT GRADE BY A CURVE in order to encourage maximum student participation and interaction. I will use the following guidelines 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:

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

Honors Collegium 70A Winter 2003

Page Three

LECTURE & DISCUSSION SCHEDULE:

<u>DATE</u>	<u>TOPIC</u>
1/7	Lecture: <i>The Age of DNA – What is Gene Engineering?</i>
1/9	Movie: <i>Inherit the Wind</i>
DISCUSSION 1:	<i>The Manipulation of Genes Recombinant DNA Debate</i>

1/14	Lecture: <i>What Are Genes & How Do They Work?</i>
1/16	Movie: <i>The Race for the Double Helix</i>
DISCUSSION 2:	<i>Useful Proteins from Recombinant DNA Discovering Genes for New Medicines</i>

1/21	Lecture: <i>How are Genes Cloned & Engineered?</i>
1/23	Movie: <i>Lorenzo's Oil</i>
DISCUSSION 3:	<i>Transgenic Livestock as Drug Factories Cloning for Medicine Cloning Noah's Ark</i>

1/28	Lecture: <i>Back to the Future -- The 21st Century Factory & Farm</i> DOUBLE HELIX ESSAY DUE
1/30	Movie: <i>History's Harvest; The Rise and Fall of GM</i>
DISCUSSION 4:	<i>Edible Vaccines How Green are Green Plastics? Seeds of Contention</i>

2/4	Lecture: <i>Science & the Constitution: Who Owns Our Genes?</i>
2/6	Movie : <i>Cracking the Code of Life; Genetically Correct</i>
DISCUSSION 5:	<i>Cystic Fibrosis Chromosome Mapping With DNA Markers Grading the Gene Tests</i>

2/11	Lecture: <i>Identifying Human Genes & Origins: Are There Races?</i>
2/13	Movie: <i>Murder, Rape, & DNA; The Case for Innocence</i>
DISCUSSION 6:	<i>When Science Takes the Witness Stand</i>

Honors Collegium 70A Winter 2003

Page Four

LECTURE SCHEDULE CONTINUED:

<u>DATE</u>	<u>TOPIC</u>
2/18	Lecture: <i>Genetic Sleuthing -- A Molecular Sherlock Holmes?</i>
2/20	Movie: GATTACA
DISCUSSION 7:	<i>Embryonic Stem Cells for Medicine Whose Blood Is It Anyway? The First Human Cloned Embryo</i>

2/25	Lecture: <i>Genetics & the Law: Past, Present, & Future?</i> TAKE HOME EXAM DUE
2/27	Movie: <i>Outbreak</i>
DISCUSSION 8:	<i>The Human Genome Business Today The Bioinformatics of Gold The Magic of Microarrays Proteins Rule</i>

3/4	Lecture: <i>Altering the Human Genome: Prospects for the Super Race?</i>
3/6	Movie: <i>Influenza, 1918; Ebola</i>
DISCUSSION 9:	<i>Gene Therapy Overcoming the Obstacles to Gene Therapy What Cloning Means to Gene Therapy</i>

3/11	Lecture: <i>Prospects for Engineering Bioweapons?</i>
3/13	Movie: <i>Bioterror; Knowledge or Certainty</i> CLASS PROJECT DUE
DISCUSSION 10:	<i>Attacking Anthrax Technology Against Terror Vigilance Defense</i>

3/18	FINAL ALL-CLASS ORAL EXAM: 8:00-11:00 AM

Honors Collegium 70A Winter 2003
Page Five

TEXT READING ASSIGNMENTS FOR LECTURES AND DISCUSSIONS:

DNA TECHNOLOGY, 2ND EDITION

LECTURE 1 None

DISCUSSION 1 Chapters 2, 4 & 5

LECTURE 2 Chapters 1, 2, & 3

DISCUSSION 2 Chapters 3, 5 & 6

LECTURE 3 Chapters 4 & 5

DISCUSSION 3 Chapter 11

LECTURE 4 Chapters 6, 10, & 11

DISCUSSION 4 Chapter 10

LECTURE 5 None

DISCUSSION 5 Chapter 7

LECTURE 6 Chapters 7, 9, & 12

DISCUSSION 6 Chapter 9

LECTURE 7 Chapters 7, 9, & 12

DISCUSSION 7 None

LECTURE 8 None

DISCUSSION 8 Chapter 12

LECTURE 9 Chapter 8

DISCUSSION 9 Chapter 8

LECTURE 10 None

DISCUSSION 10 None

Honors Collegium 70A Winter 2003
Page Six

REFERENCE MATERIAL: These books are on reserve in the Powell Library, and complement and expand on the topics covered in both the lectures and discussions. They represent an excellent collection of reference books on molecular biology, genetics, biotechnology, human cloning, molecular biology history, genetic engineering, and legal/constitutional issues as it applies to breakthroughs in genetic/cloning technologies. These books may be helpful for your essay assignment, the exams, the class project, and expanded “horizons.”

A Practical Companion To The Constitution – J.K. Lieberman
Actual Innocence: When Justice Goes Wrong And How To Make It Right – Scheck et al.
Analysis Of Biological Development -- K. Kalthoff
An Introduction To Genetic Analysis – Seventh Edition -- Griffiths et al..
Asking About Life -- Second Edition -- Tobin & Dusheck
Applied Molecular Genetics -- R.L. Miesfeld
Ascent Of Man -- Bronowski
Asking About Cells -- First Edition -- A. Tobin & R.E. Morel
Biochemistry -- Third Edition -- V. Holde et al.
Biochemistry -- Forth Edition -- L. Stryer
Biology -- Sixth Edition -- Raven & Johnson
Biology Of Cells - Fifth Edition --Curtis And Barnes
Biotechnology - An Introduction -- Barnum
Chemical & Biological Warfare – Eric Cody
Clone: The Road To Dolly & The Path Ahead – G. Kolata
Coning And The Constitution – I. H. Carmen
Correcting The Code -- L. Thompson
Dealing With Genes -- Berg & Singer
DNA Science -- Miklos & Freyer
DNA Technology -- Second Edition -- I.E. Alcamo (**Class Text**)
Double-Edged Sword -- K. Drlica
Eighth Day Of Creation -- Second Edition -- Judson
Essential Cell Biology -- Alberts et al.
Gene Cloning – Third Edition -- T.A. Brown
Genetics - Analysis Of Genes And Genomes -- Fifth Edition -- Hartl & Jones
Genetics -Sixth -- Klug & Cummings
Genetics- From Genes To Genomes - L. Hartwell et al.
Genetics, Society, & Clinical Practice -- Harper & Clarke
Genetic Privacy – Graeme Laurie
Genomes -- T.A. Brown
Human Genetics – The Molecular Revolution -- E. Mcconkey
Human Genetics – Third Edition -- Vogel & Motulsky
Human Molecular Genetics -- Second Edition -- Strachan & Read
Introduction To Molecular Medicine -- Leder et al.
Life: The Science Of Biology – Sixth Edition -- Purves et al.
Molecular Biology Of The Cell -- Third Edition -- Alberts et al.
Molecular Biotechnology -- Second Edition -- Glick & Pasternak
Molecular Cell Biology – Forth Edition -- Lodish et al.
Molecular Cloning - Third Edition -- Sambrook et al.
Mood Genes: Hunting For The Origins Of Mania & Depression – S. Barondes
Plants, Genes, & Crop Biotechnology – *Second Edition*-- Chrispeels & Sadava
Principles Of Genetics -- Second Edition -- Snustad & Simmons
Principles Of Gene Manipulation -- Sixth Edition – Primrose et al. (**Excellent Reference Book**)
Recombinant DNA -- Second Edition -- Watson et al.
Rosalind Franklin – The Dark Lady Of DNA – B. Maddox (**Class Optional Book**)
The Cell- A Molecular Approach -- Cooper
The Double Helix – Watson (**Class Text**)
Understanding DNA & Gene Cloning -- Second Edition -- K. Drlica

Honors Collegium 70A Winter 2003

Page Seven

DISCUSSION SECTION BIBLIOGRAPHY: Scientific American articles are required reading for Discussion Section. Scientific American articles from 1993 and later can be downloaded from the web at: <http://www.sciamarchive.org/html/main.asp>. Note: You can access these articles only from a UCLA account because the UC has an electronic subscription to *Scientific American*. PDF files of these articles can also be downloaded from the class web site. Scientific American articles prior to 1993 will be handed out in class.

WEEK ONE – The Basics of Genetic Engineering

1. Stanley N. Cohen, *The Manipulation of Genes*.
Scientific American, July, 1975, **233 (1)**, 24-33.
2. Clifford Grobstein, *The Recombinant DNA Debate*.
Scientific American, July, 1977, **237 (1)** 22-33.

WEEK TWO – Using Genes to Make Drugs

1. Walter Gilbert and Lydia Villa-Komaroff, *Useful Proteins From Recombinant Bacteria*.
Scientific American, April, 1980, **242 (4)**, 74-94.
2. William A. Haseltine, *Discovering New Genes For Medicine*.
Scientific American, March, 1997, **276 (3)**, 92-97.

WEEK THREE -- Using Animals as Drug Factories

1. William H. Velander, Henryk Lubon, and William N. Drohan, *Transgenic Livestock as Drug Factories*. Scientific American, January 1997, **276 (1)**, 70-74.
2. Ian Wilmut, *Cloning For Medicine*. Scientific American, December 1998, **279 (6)**, 58-63.
3. Robert P. Lanza, Betsy L. Dresser, and Philip Damiani, *Cloning Noah's Ark*.
Scientific American, November, 2000, **283 (5)**, 85-89

WEEK FOUR – Using Plants as Factories for Drugs and Plastics

1. William H. R. Langridge, *Edible Vaccines*, Scientific American, September, 2000, **283 (3)**, 66-71.
2. Tillman U. Gerngross and Steven C. Slater, *How Green Are Green Plastics?*
Scientific American, August, 2000, **283 (2)**, 37-41.
3. Kathryn Brown, *Seeds of Concern*, Scientific American, April, 2001, **284 (4)**, 52-57.

WEEK FIVE – Identifying and Testing for Human Disease Genes

1. Michael J. Welsh and Alan E. Smith, *Cystic Fibrosis*, Scientific American, December, 1995, **273 (6)**, 52-59.
2. Ray White and Jean-Marc Lalouel, *Chromosome Mapping with DNA Markers*.
Scientific American, February, 1988, **258 (2)**, 40-48.
3. John Rennie, *Grading the Gene Tests*. Scientific American, June, 1994, **270 (6)**, 89-97.

WEEK SIX – Using DNA Testing in the Courtroom

1. Peter J. Neufeld and Neville Colman, *When Science Takes the Witness Stand*.
Scientific American, May, 1990, **262 (5)**, 46-53.
2. Jerry Adler and John McCormick, *The DNA Detectives*. Newsweek, **November 16, 1998**, pg. 64-71 (public domain).
3. Barbara Murray and Brian Duffy, *Jefferson's Secret Life*. U.S. News & World Report, **November 9, 1998** (public domain).

Page Eight

WEEK SEVEN – Embryonic Stem Cells and Human Cloning

1. Roger A. Pedersen, *Embryonic Stem Cells For Medicine*. Scientific American, April, 1999, **280 (4)**, 68-73.
2. Ronald M. Kline, *Whose Blood Is It Anyway?* Scientific American, April, 2001, **284 (4)**, 42-49.
3. Jose B. Cibelli, Robert P. Lanza, Michael West, and Carol Ezzell, *The First Human Cloned Embryo*. Scientific American, January, 2002, **286 (1)**, 44-51.

WEEK EIGHT – The Promise of Genomics for Medicine

1. Kathryn Brown, *The Human Genome Business Today*. Scientific American, July, 2000, **282 (1)**, 50-55.
2. Ken Howard, *The Bioinformatics Gold*. Scientific American, July, 2000, **282 (1)**, 58-63.
2. Stephen H. Friend and Roland B. Stoughton, *The Magic of Microarrays*. Scientific American, February, 2002, **286 (2)**, 44-53.
3. Carol Ezzell, *Proteins Rule*. Scientific American, April, 2002, **286 (4)**, 40-47

WEEK NINE -- Gene Therapy: Fixing Human Genetic Defects

1. Inder M. Verma, *Gene Therapy*. Scientific American, November, 1990, **263 (5)**, 68-84.
2. Theodore Friedman, *Overcoming the Obstacles to Gene Therapy*. Scientific American, June, 1997, **276 (6)**, 96-101.
3. Steve Mirsky and John Rennie, *What Cloning Means for Gene Therapy?* Scientific American, June, 1997, **276 (6)**, 122-123.

WEEK TEN -- Anthrax and Defending Against Bioweapons

1. John T. Young and R. John Collier, *Attacking Anthrax*. Scientific American, March, 2002, **286 (3)**, 48-59.
2. Rocco Casagrande, *Technology Against Terror*, Scientific American, October, 2002, **287 (3)**, 83-87.
3. Stephen S. Morse, *Vigilance Defense*, Scientific American, October, 2002, **287 (3)**, 88-89.