BISC 110: Good Genes, Bad Genes
Units: 4
Spring 2016
Lecture: Mon, Wed 12-1:50pm in ZHS 163

Discussion Section (50 minutes): Tuesdays 9-9:50am & 2-2:50pm or Wednesdays 9-9:50am, all in ZHS 460

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Office: TBD
Office Hours: TBD
Contact Info: TBD
Course Description and Learning Objectives
BISC 101 will provide non-major undergraduates with a basic understanding of molecular biology, with a particular emphasis on how advances in molecular biological research have impacted medicine, commerce, and society in general. The course will introduce students to the Scientific Method, the basics of experimental design and data interpretation, and will allow students to emerge with an ability to think critically about DNA-based science and how these technologies influence modern life, in both positive and negative ways. The course is structured around three modules. The first, "The Central Dogma", will provide students with a foundation in molecular biology. The course will then consider two "revolutions", which are designed to educate students about how major breakthroughs in the laboratory can quickly spill over into commercialization and political policy, with controversial side effects for which there are no easy answers.

The first revolution to be considered will be that of molecular biology itself. We will examine how the process of gene cloning was developed, and how these discoveries launched the biotechnology industry with the founding of Genentech in 1976 and Biogen in 1978. The module will examine how recombinant DNA technology was first received by society, and how there were immediate commercial successes, most notably with insulin and human growth hormone. The module will also examine the often-uneasy partnership between academia and industry, by studying the landmark legal battle between Genentech and UCSF over intellectual ownership of the blockbuster drug Protropin.

We will next consider the revolution in genomics, made possible by rapid advances in DNA sequencing technologies. Students will learn about genome organization and how genome sequencing has lead to the promise of personalized medicine based on an individual’s DNA sequence. We will also consider the moral and ethical problems that arise when a person’s genome sequence is made available.

Lastly, we will examine the recent revolution in animal cloning and stem cell biology. Students will learn about Dolly, the first mammal to be cloned, and this will allow a discussion of the moral implications that come with this technology. We will also cover stem cell biology, which will emphasize the promise of regenerative medicine, as well as the political implications of stem cell research by discussing the Bush Administration’s restrictions on stem cell research in the first decade of this century. A final line of inquiry in this module will explore how the overwhelming promise of stem cell research has repeatedly tempted some researchers down the dark path of scientific fraud, by using the story of South Korea’s Hwang Woo-suk as a case study.

The course is designed to satisfy the GE-D requirement for Core Literacies under the New USC General Education Program.

Prerequisite(s): none
Co-Requisite(s): none
Concurrent Enrollment: none
Recommended Preparation: High School Biology

Course Notes
Standard letter grading will be used. Grading determined by scores on the three exams (33% each).

Required Reading and Supplementary Materials
The Gene, An Intimate History by Siddhartha Mukherjee (Scribner, 2016).
Amazon link: https://www.amazon.com/Gene-Intimate-History-Siddhartha-Mukherjee/dp/1476733503/ref=sr_1_1?ie=UTF8&qid=1480348642&sr=8-1&keywords=The+Gene
Description and Assessment of Assignments
BISC101 is a standard, lecture-based course. Students are expected to attend lecture. Student learning will be assessed through Exams.

Grading Breakdown
<table>
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<tr>
<th>Exam</th>
<th>Points</th>
<th>Percentage of Final Grade</th>
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<tbody>
<tr>
<td>Exam I</td>
<td>100</td>
<td>33%</td>
</tr>
<tr>
<td>Exam II</td>
<td>100</td>
<td>33%</td>
</tr>
<tr>
<td>Exam III</td>
<td>100</td>
<td>33%</td>
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Assignment Submission Policy
n/a

Additional Policies
None
## Course Schedule: A Weekly Breakdown

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<tr>
<th>Week</th>
<th>Topics</th>
<th>Reading Assignment</th>
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| **Week 1** 1/9 & 1/11 | MODULE I: THE CENTRAL DOGMA  
1/9 – Course overview + film (Cracking Your Genetic Code)  
1/11 – Mendel: From the Garden to the Genome + film | The Gene pp. 15-17 & 47-63 |
| **Week 2** 1/16 & 1/18 | 1/16 – MLK Jr. holiday  
1/18 – The chromosome theory of inheritance | The Gene pp. 91-110 |
| **Week 3** 1/23 & 1/25 | 1/23 – Chromosomes, genes, and DNA  
| **Week 4** 1/30 & 2/1 | 1/30 – DNA replication and repair  
2/1 – Cracking the genetic code | The Gene pp. 161-171 |
| **Week 5** 2/6 & 2/8 | 2/6 – PaJaMo and the Central Dogma  
2/8 – Module I review and Intro to Gene cloning | The Gene pp. 172-185 |
| **Week 6** 2/13 & 2/15 | MODULE II: THE REVOLUTION IN MOLECULAR BIOLOGY  
2/13 – EXAM I  
2/15 – Gene cloning and political fallout | The Gene pp. 203-214; 225-235 |
| **Week 7** 2/20 & 2/22 | 2/20 – Presidents’ holiday  
2/22 – Genes, Medicines, and Money | The Gene pp. 236-244 |
| **Week 8** 2/27 & 3/1 | 2/27 – PCR and forensic science + film (Catching Killers: DNA Profiling)  
3/1 – Genomes and DNA sequencing | The Gene pp. 215-224 |
| **Week 9** 3/6 & 3/8 | 3/6 – film (NOVA, Cracking the Code of Life)  
3/8 – Genetic disease | The Gene pp. 293-326 |
| **Week 10** 3/13 & 3/15 | ! Spring Break !! | |
| **Week 11** 3/20 & 3/22 | 3/20 – Viral disease: HIV and SARS  
| **Week 12** 3/27 & 3/29 | 3/27 – Personalized medicine and CRISPR  
3/29 – Module II review and Intro to Developmental Biology | The Gene 437-483 |
| **Week 13** 4/3 & 4/5 | 4/3 – Exam II  
MODULE III: THE REVOLUTION IN STEM CELLS  
4/5 – Nuclear reprogramming & cloning a sheep | |
| **Week 14** 4/10 & 4/12 | 4/10 – Stem cells I  
4/12 – Stem cells II | |
| **Week 15** 4/17 & 4/19 | 4/17 – Stem cells III  
4/19 – Stem cells IV | |
| **Week 16** 4/24 & 4/26 | 4/24 – Module III review  
4/26 – Exam III | |
Statement on Academic Conduct and Support Systems

Academic Conduct
Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity http://equity.usc.edu/ or to the Department of Public Safety http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems
A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information http://emergency.usc.edu/ will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.