LIFE SCIENCES 15
LIFE: CONCEPTS AND ISSUES

SUMMER 2020 (online)

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Zoom link on course website
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COURSE DESCRIPTION
Science touches our lives everyday. Its increasing relevance is clear in a multitude of areas, including modern genetics & biotechnology, nutrition & health, and brain functioning & behavior. Maybe you’ve pondered questions such as these:

* Is eyewitness testimony in courts always accurate?
* Why doesn’t evolution lead to the production of perfect organisms?
* Why are humans among the only species to have friendships?
* Does sunscreen use reduce skin cancer risk? How do we know that’s true?
* Do vitamin supplements reduce the likelihood of getting sick?
* What are taste preferences? Why do they exist?
* What is “blood doping?” How does it improve athletic performance?
* How does caffeine (and other drugs) work?
* What are emotions? Why are they less permanent than they feel?
* Can culture free us from our biology? Does it?

In Life Science 15, we explore these topics and many others. We’ll go beyond the facts as we dissect the process of scientific thinking. We will see that it is an intellectual activity, encompassing observation, experimentation, and explanation of natural phenomena. And perhaps more importantly, it is a practical pathway to discover and better understand our world.

I hope you will find answers to questions you’re curious about and will be spurred to ask many more. Above all, as we investigate how we can best use evidence to guide decision making in our own lives, I hope you’ll learn that biology is about you and touches every aspect of your life. It’s creative and it’s fun.

NAVIGATING AN ONLINE COURSE
This online version of Life Science 15 is an experiment in education. There are no live lectures for this class, however, as your instructor I will be closely involved in every aspect of the course. I have designed the course, created all of the content videos, and written the books. I’ll be meeting with your TAs regularly and will hold weekly office hours via Zoom meetings. And I will be reviewing and evaluating all of your assignments.

I look forward to getting to know you and hearing your feedback on the course. It is important for me to hear what is valuable and engaging for you as well as any ideas you have for improving the experience. –JP
COURSE REQUIREMENTS

150 • Midterm Exam  (Week 3)

250 • Final Exam  (Week 6)

150 • Discussion Section  (Weekly)
  Participation - 30 pts
  Debate - 40 pts
  Problem Set Solution Presentation to Section - 20 pts
  Quiz (from Problem Set; 6 quizzes @ 12 pts each; lowest score dropped = 60 pts

125 • Discussion Board Assignments (25 pts each; due Tuesdays at 5pm)
  Week 1: Self-reflection 1
  Week 2: Photo Post 1
  Week 3: Short Science Summary
  Week 5: Photo Post 2
  Week 6: Self-reflection 2

50 • Music Video / Movie Trailer-Promo  (Week 5)

25 • Response to others' posts and video/trailer  (1-4 pts for each, up to max. of 25 pts)

750 • Total Points Possible

REQUIRED READINGS / MATERIALS

  (Note: For What Is Life? you must get the 4th edition; also make sure it is the “with physiology” version)
• Mean Genes by T. Burnham and J. Phelan. 2012. Basic Books (1st or 2nd edition is okay) - mg
• Content Videos - These are posted on the course website.

EXAMS

There are two exams in this class: one midterm and one final. They include multiple choice and short answer questions. The midterm is available from 12pm-6pm (PDT time) on Friday of Week 3. You have 90 minutes to complete it once you begin. It will cover all material from Weeks 1-3 and Problem Sets 1-3. The final is available from 12-6pm (PDT time) on Friday of Week 6. You have 180 minutes to complete it once you begin. It will cover all material, with an emphasis on midterm covered after the midterm. On the exams, you may use your book and class notes, but no other outside resources.

Makeup exams and quizzes are not given. If you are unable to take an examination, you are responsible for contacting the Life Science Core Office before the examination. You must have written verification regarding the situation. If you feel that an error was made in the grading of your exam, submit your exam with a detailed explanation to the LS Core Office by July 24th.
DISCUSSION SECTION AND PROBLEM SETS

**Problem Sets:** Posted at the beginning of each week, these will include a brief discussion of a topic with some short answer problems. You will not turn in your answers to the problem set, but they will help you prepare for the exams and the weekly quizzes.

**Discussion section** - Discussion section meets on Zoom on Thursdays for 75 minutes. For your participation you will receive up to 30 points.

**Quizzes** - At the beginning of section, there will be a quiz. This quiz will be based on one of the problems from the problem set. Missed quizzes cannot be made up. You must attend the entire section to get credit for your quiz.

**Debate** - In three of the section meetings there will be a debate. You will take part directly in one debate. Six students will participate in each debate, three on each side of the issue. The debate will take approximately 30 minutes and will include:
- Opening arguments (5 minutes for each side)
- Break for teams to think about their rebuttal (3 minutes)
- Response to other side (4 minutes for each side)
- Questions from TA/class (8 minutes total)

Each student on a team gets the same score, based on preparation, presentation, rebuttal relevance and persuasiveness, and responses to questions.

**Problem Set Solution Presentation to Section** - Each week, one group of students will present an oral description of their solution to one of the Problem Set questions. (Assignment of the specific question will be given when the problem set is distributed.)

DISCUSSION BOARD ASSIGNMENTS

Each week (except Week 4) there will be a Discussion Board Assignment. These will consist of posts (some short text responses, some photos) made to the course discussion board. Specific details of these assignments are posted below and will also be posted on the course website. They are due on Tuesdays at 5pm. For each day that they are late, 5 points will be subtracted.

MUSIC VIDEO / MOVIE TRAILER / ETC.

**Assignment** - Make a music video or mock/parody movie trailer about any of the life science concepts we cover in Life Science 15. The lyrics/content should include (mostly) technical, scientific, and accurate information about one or more ideas we have investigated. Also, be sure to mention “UCLA” and “LS15” in your video (either verbally or in writing).

* Your video can be completely original or a parody of one of your favorite songs or movies.
* The length should be between two and three minutes (no more than four minutes).
* You may work by yourself or in teams of up to 5 people.
* Each person on a given team will receive an identical score.
* You must post the video to youtube. Include the lyrics as captions within your video—this can be done with editing software or through youtube once you have uploaded your video file. (Be aware that it may take up to 1-2 hours to upload your video to youtube.)

To turn in your assignment, send an active youtube link for your video to jay@ucla.edu. In this email, include the full names, ID#,s, and email addresses for all teammates.

Videos will be graded by the teaching staff and evaluated based on incorporation of biology and scientific ideas, creativity, entertainment factor, and overall quality. Surprise us. Make us laugh. Make us cry.

Here are a few examples of good videos from previous quarters:
* https://www.youtube.com/watch?v=JsMm5PYiB2o&fbclid=
* https://www.youtube.com/watch?v=G3qwa4Q7jO0
* https://www.youtube.com/watch?v=4GlCrmwQNi8
* https://www.youtube.com/watch?v=tEPLcBsWUCw&feature=youtu.be

**Responses to Post from Other Students**
All students are encouraged to post thoughtful, constructive, supportive responses to the posts of other students in the class. For these, you can earn 1-4 points, up to a maximum of 25 points.

**The Life Sciences Core Office**
For administrative or scheduling problems relating to this course, please go to the Life Sci. Core Office in Life Sci. Bldg., room 2305, or contact Lily Yanez: lyanez@lifesci.ucla.edu, 825-6614.
# Schedule of Topics for LS15

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
</table>
| 1    | 1. The age of science  
       | 2. Scientific thinking and decision-making  
       | 3. Darwin’s dangerous idea |
       | *Discussion Section topic: Science as a way of figuring things out |
| 2    | 4. Nurturing nature: the power of culture  
       | 5. What did Mendel discover?  
       | 6. Kindness to our kin |
       | *Discussion Section topic: Natural selection |
| 3    | 7. Friend and foe are fluid categories  
       | 8. Unexpected conflict, unexpected cooperation  
       | 9. Exam (covers material from topics 1-8; Problem Sets 1-3) |
       | *Discussion Section topic: Genes and DNA |
| 4    | 10. Modern genetics and biotechnology: DNA fingerprinting  
       | 11. Proteins, carbs, and fats: nutrition and health  
       | 12. The trouble with testosterone: hormones and sex differences |
       | *Discussion Section topic: Altruism |
| 5    | 13. Reproduction: eggs are big, sperm are small, and that matters  
       | 14. Neurons, brains, and our connection to the external world  
       | 15. What gives drugs their power? Caffeine & alcohol: case studies |
       | *Discussion Section topic: Nervous system functioning |
| 6    | 16. Flourishing in our alien, industrial environment  
       | 17. Evolution and emotions: finding (and creating) happiness  
       | 18. Final Exam (comprehensive, with focus on topics 10-17; Problem Sets 4-6) |

*Discussion Section topic: Industrial societies: Life in an alien environment*
## Week 1

<table>
<thead>
<tr>
<th>Topic</th>
<th>Content Videos</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The age of science</td>
<td><strong>WIL:</strong> 1</td>
</tr>
<tr>
<td></td>
<td>* video: Introduction to the course and description of logistics</td>
</tr>
<tr>
<td></td>
<td>* video: Rainy days and Mondays: What is scientific thinking and how do we use it?</td>
</tr>
<tr>
<td>2. Scientific thinking and decision-making</td>
<td>* video: Scientific thinking and decision making</td>
</tr>
<tr>
<td>3. Darwin’s dangerous idea</td>
<td><strong>MG:</strong> 1 <strong>WIL:</strong> 10</td>
</tr>
<tr>
<td></td>
<td>* video: Evolution and natural selection</td>
</tr>
<tr>
<td></td>
<td>* video: What is survival of the fittest? Is it a misnomer?</td>
</tr>
<tr>
<td></td>
<td>* videos: Mechanisms of evolution * Modes of selection</td>
</tr>
<tr>
<td></td>
<td>* video: What is genetic drift? When is it important?</td>
</tr>
<tr>
<td></td>
<td>* video: What is fitness? What is an evolutionarily successful organism?</td>
</tr>
</tbody>
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### Discussion Board Post

**Self-reflection 1**

Choose one of the following options and post your response to the discussion board on the course website. Your response should be 100 to 300 words in length.

* “I’m not a science person.” Why might you (or someone you know) have ever said that? Using examples, explain a) why this is not actually an accurate assertion, and b) why this is potentially a harmful thing to say.

* Where do you look when you want scientific info about something? Using a real example from your own life, describe what you learned and the extent to which it satisfied your need (or did not).

### Discussion Section

**Problem Set**

Science as a way of figuring things out (PSet 1)

**Debate Topic**

none

**Quiz**

Short answer question similar to PSet 1, during first 10-minutes of section.
Week 2

4. Nurturing nature: the power of culture

- **videos:** Hardy-Weinberg and population genetics * Examples and applications
- **video:** Nature and nurture interacting: The norm of reaction
- **video:** Adaptation and the relationship between form and function
- **video:** Sexual selection and flashy traits and displays

5. What did Mendel discover?  

- **video:** Who was Mendel and why do we still care?
- **videos:** Mendel’s law of segregation * Using and interpreting a Punnett Square
- **video:** Mendel’s 2nd Law: Independent assortment
- **videos:** The test cross * Sex Determination and the behavior of sex-linked traits
- **videos:** Interpreting pedigrees * Probabilities: How to be 95% sure you’ll have a boy?
- **videos:** Variations on Mendel: incomplete dominance and codominance * Blood types
- **videos:** Meiosis and the generation of variation * The non-disjunction problem

6. Kindness to our kin

- **video:** Intro to kin selection: fitness vs. inclusive fitness
- **videos:** Hamilton’s rule * Relatedness * Kin recognition
- **video:** Kin selection predictions: Who do people bequeath money to in their wills?

Discussion Board Post

**Photo Post 1**

* Often, there are multiple evolutionary solutions to the same set of selective pressures. Post a pair of photos (taken by you) showing two different evolutionary solutions for the same problem. Include a description and explanation for your photos.

* Post a photo of (or advertisement for) a product or service that makes a health claim. Describe what would constitute reasonable evidence for the claim. Investigate and report on the actual evidence for the claim.

Discussion Section

- **Problem Set**  
  * Evolution and Natural Selection (PSet 2)

- **Debate Topic**  
  * none

- **Quiz**  
  * Short answer question similar to PSet 2, during first 10-minutes of section.
Week 3

**Topic** | **Content Videos** | **Readings**
--- | --- | ---
7. Friend and foe are fluid categories | *video:* Why are humans among the few species to have friendships?  
*video:* Certain conditions are conducive to reciprocal altruism. | *MG:* 10, 11

8. Unexpected conflict, unexpected cooperation | *video:* Inbreeding and unexpected cooperation  
* video: Reciprocal altruism can reduce conflict. | *WIL:* 11

**Midterm Exam**
Short answer & multiple choice. Covers material from topics 1-8 and Problem Sets 1-3.

**Discussion Board Post**

**Short Science Summary**

Select and read one of the peer-reviewed research articles posted on the course website (titles are below). Write a summary for a 15-year-old. In your summary, describe 1) the main point or finding, an important weakness of the study, 2) the coolest methods or result, and 3) why they might care. Your response should be 100 to 300 words in length.

* “Peahens prefer peacocks with elaborate trains.”
* “Hormone replacement therapy and mortality in 52- to 70-year-old women: the Kuopio Osteoporosis Risk Factor and Prevention Study.”
* “Effects of supraphysiologic doses of testosterone on mood and aggression in normal men.”
* “Early contributions to infants’ mental rotation abilities.”
* “No effect of commercial cognitive training on brain activity, choice behavior, or cognitive performance.”
* “Altruism predicts mating success in humans.”
* “The masculinity paradox: facial masculinity and beardedness interact to determine women’s ratings of men’s facial attractiveness.”
* “A double-blind test of astrology.”
* “Characterizing the molecular epidemiology of Staphylococcus aureus across and within fitness facility types.”
* “What is the evidence for rest, ice, compression, and elevation therapy in the treatment of ankle sprains in adults?”
* “Evaluation of the potential for virus dispersal during hand drying: a comparison of three methods.”
* “Is the last man standing in comedy the least funny? A retrospective cohort study of elite stand-up comedians versus other entertainers.”
* “The effect of different degrees of ‘positive’ human–animal interaction during rearing on the welfare and milk production of commercial dairy cows.”
* “Does natural selection favour taller stature among the tallest people on earth?”
* “The 7R polymorphism in the dopamine receptor D4 gene (DRD4) is associated with financial risk-taking in men.”
* “Advancing lie detection by inducing cognitive load on liars: a review of theories and techniques guided by lessons from polygraph-based approaches.”
* “Low glucose relates to greater aggression in married couples.”
* “Yawning as a brain cooling mechanism.”

**Discussion Section**

**Problem Set**
Genes and DNA (PSet 3)

**Debate Topic**
“Genetic screening for all known diseases should be mandatory.”

**Quiz**
Short answer question similar to PSet 3, during first 10-minutes of section.
Week 4

<table>
<thead>
<tr>
<th>Topic</th>
<th>Content Videos</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Genetics and biotechnology: DNA fingerprinting</td>
<td>video: What is a DNA fingerprint and how can it be used in forensics? video: Individual differences in DNA: STRs videos: STR analysis and DNA fingerprinting * Difficulties and controversies</td>
<td>WIL: 6, 7</td>
</tr>
<tr>
<td>11. Proteins, carbs, and fats: nutrition and health</td>
<td>video: Biofuels and the conversion of energy to more usable forms video: Why we need energy and how we get it video: Macromolecules and their role in our diet - lipids, carbs, and proteins video: Measuring, manipulating, and comparing metabolism video: What is lactose intolerance, and how does it involve enzyme activity? video: Drinking a diet soda can be deadly if you carry a single bad gene. Why? video: What is the difference between vitamins and minerals, and why do we need them? video: Is it true that certain food combinations should not be eaten together? video: Why do we have food preferences? video: Diets and feeding mechanisms vary extensively among animals. videos: Metabolism * Digestion and absorption * Fiber &amp; essential nutrients</td>
<td>WIL: 2, 3, 23 MG: 2, 3</td>
</tr>
</tbody>
</table>

Discussion Section

<table>
<thead>
<tr>
<th>Problem Set</th>
<th>Altruism (PSet 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debate Topic</td>
<td>Cultural, not genetic, causes are the basis of human conflict.</td>
</tr>
<tr>
<td>Quiz</td>
<td>Short answer question similar to PSet 4, during first 10-minutes of section.</td>
</tr>
</tbody>
</table>
# Week 5

## Topic | Content Videos | Readings
--- | --- | ---
13. Reproduction: eggs are big, sperm are small, and that matters | **video:** Early nurturing is necessarily female.  
**video:** Males have higher reproductive capacity but are never certain of paternity  
**video:** Women and men are vulnerable in different ways.  
**videos:** Mate guarding  
**videos:** Sperm competition  
**videos:** What is a mating system? | **WIL:** 11, 26 (sec 5)  
**MG:** 8, 9

14. Neurons, brains, and our connection to the external world | **videos:** Nervous system overview  
**video:** Where do action potentials begin: dendrites and our senses  
**video:** Do we really only use 10% of our brains? | **WIL:** 24  
**MG:** 4

15. What gives drugs their power? Caffeine & alcohol: case studies | **video:** The synapse  
**videos:** Do-it-again centers in the brain  
**videos:** Botox and the synapse  
**videos:** What is caffeine and how does it work?  
**video:** NT receptors and behavior: dopamine and risk-taking | **WIL:** 24  
**MG:** 4

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**Discussion Board Post**

**Photo Post 2**  
Choose one of the following options and post your response to the discussion board on the course website. In addition to the posted photo(s), your response should be 50 to 250 words in length.

* Post a photo of an interesting graph you encounter in your everyday life. Describe where it comes from and what it is saying. How could it be made more effective?

* Post photos of nutritional labels from three different foods having the same number of calories per serving but coming from different combinations of macromolecules. Explain how they differ and the health implications.

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**Discussion Section**

**Problem Set**  
Nervous System Functioning (PSet 5)

**Debate Topic**  
“Humans have transcended evolution.”

**Quiz**  
Short answer question similar to PSet 5, during first 10-minutes of section.
### Week 6

<table>
<thead>
<tr>
<th>Topic</th>
<th>Content Videos</th>
<th>Readings</th>
</tr>
</thead>
</table>
| 16. Flourishing in our alien, industrial environment | *video:* Industrial societies: life in an alien environment  
*video:* What is culture?  
*video:* Culture breaks down the fundamental reproductive equation. | *MG:* 5, 6 |
| 17. Evolution and emotions: finding (and creating) happiness | *video:* Finding (and creating) happiness  
*video:* LS15: Take Home Messages? | *MG:* 12 |
| 18. Final Exam | | |

**Discussion Board Post**

**Self-reflection 2**  
*Post your response to the following question to the discussion board. Your response should be 100 to 300 words in length.*

* An important feature of scientific thinking is that it can tell us when we should change a belief we hold about the natural world. Describe an instance of scientific thinking causing you to change your mind. What was your belief and why did you change it?

**Discussion Section**

**Problem Set**  
*Industrial societies - Life in an alien environment (PSet 6)*

**Debate Topic**  
*none*

**Quiz**  
Short answer question similar to PSet 6, during first 10-minutes of section.

**Final Exam**  
Short answer & multiple choice. Comprehensive, with a focus on topics 10-17 and PSets 4-6.