

BIOL-010 Knowing: Science as Narrative

Course Description

Science is messy. Stories of scientific discoveries are never straightforward. Science is done by people whose judgements could be biased and limited by the tools available. Thus, scientific work is constantly re-evaluated and challenged. This course is designed to help students recognize that science is a method to investigate nature, not a collection of established facts. Students will learn some of the fundamental biological concepts and how they were derived and tested. Articles and videos will be assigned to discuss how scientific knowledge is obtained, subjected to scrutiny, and modified. In order to reinforce the understanding of the scientific method, the course includes lab components in which students will extract DNA from a banana at home and observe the microstructure of biological samples using a Foldscope. This course satisfies the Science for All Core requirement.

Mode of Instruction

TBD

Instructor

Professor Youngeun (Kaitlyn) Choi | yc709@georgetown.edu

Lecture Time

MTWR 10:45 – 12:45pm

Office Hours

TBD

Prerequisites

None

Learning Objectives

Upon successful completion of this course, students should be able to:

- Explain the central dogma of biology and the role of the microbes in human health.
- Evaluate the scientific, social, and ethical implications of the human microbiome research and applications.
- Understand how scientific knowledge is obtained, subject to scrutiny, and modified.
- Interpret biological data with a good understanding of certainty vs. uncertainty and demonstrate the ability to evaluate scientific information

Recommended Reading

- Recommended: Fowler, S., Roush, R., and Wise, J. (2013) *Concepts of Biology*, 1st ed. OpenStax College.
 - A digital copy of this textbook is free and available online: <https://open.umn.edu/opentextbooks/textbooks/concepts-of-biology>
 - For each lecture, a link to the relevant chapter will be posted on Canvas.

Grading

Your grade will be determined as follows:

1 writing assignment	10 pts
2 lab reports (10 pts x 2)	20 pts
Midterm	30 pts
Final exam	30 pts
Group discussion	5 pts
<u>Attendance and in-class participation</u>	<u>5 pts</u>
Total	100 pts

- Writing Assignment
Find a molecule, a biological process, or a topic covered in class that was interesting to you. Compose a letter (2-3 pages) to describe it to someone who is close to you and does not know much about biology. It could be your grandparents, parents, high school teachers (not biology teachers) or your friends. You can include hand-drawn diagrams in your letter. The grading rubric will be available on Canvas.
- Lab Reports
There will be two lab activities with different themes in this class. The lab report format will be explained in detail in class and I will hold extra office hours to help you write your findings and conclusions.
- Attendance
You are expected to attend all meetings unless you are ill or have some other emergency. Please contact me *ahead of time* if you are unable to attend a meeting. You can have one unexcused absence. After that, a point will be deducted from your participation grade for an additional unexcused absence.
- Late policy
An assignment submitted late will receive a 5% deduction for each day late. Please contact me *ahead of time* if you have an unavoidable conflict and need an extension.

Honor Code

Georgetown's Honor System outlines the Standards of Conduct you are expected to uphold as a member of the Georgetown Community. Academic dishonesty is strictly prohibited at Georgetown. For more details about the University Honor System, please refer to the following source: <https://honorcouncil.georgetown.edu/system/policies> You are expected to be conversant with all the details contained here. Anyone caught cheating on any class work will be reported to the Honor Council.

Intellectual Property Statement

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Sexual Misconduct

Please know that as a faculty member I am committed to supporting survivors of sexual misconduct, including relationship violence, sexual harassment and sexual assault. However, university policy also requires me to report any disclosures about sexual misconduct to the Title IX Coordinator, whose role is to coordinate the University's response to sexual misconduct. Georgetown has a number of fully confidential professional resources who can provide support and assistance to survivors of sexual assault and other forms of sexual misconduct. More information about campus resources and reporting sexual misconduct can be found at <https://sexualassault.georgetown.edu/>

Inclusivity and Diversity*

I would like to create a learning environment for my students that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.) To help accomplish this:

- If you have a name and/or set of pronouns that differ from those that appear in your official records, please let me know.
- If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. If you prefer to speak with someone outside of the course, your academic dean or the Office of Student Affairs are excellent resources.
- We are all on the continuum of learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.
- As a participant in course discussions, you should strive to honor the diversity of your classmates.

* Adapted from Profs. Rolfes and Green's statement.

Lecture Schedule (subject to change)

Class #	Day	Date	Lecture/Lab Topic	Assignment Due*
1	M	6/7	Lecture: Course Intro & DNA as a hereditary molecule Deep dive: Hershey-Chase experiment	
2	T	6/8	Lecture: What is DNA? What Deep dive: How can we save a video file in DNA?	
3	W	6/9	Lecture: Transcription Deep dive: How can mRNA be a vaccine?	
4	R	6/10	Asynchronous: Watch PBS's <i>Decoding Watson</i>	Film reflection (6/12)
5	M	6/14	Lecture: Translation and genetic code Discussion: <i>Decoding Watson</i>	
6	T	6/15	Discussion: Why should we trust science? & Diversity in Science	Dr. Oreskes's TED talk " Why we should trust scientists "; Reading (TBD)
7	W	6/16	Lecture: Extracellular inheritance Deep dive: Three-parent baby	
8	R	6/17	Lab: DNA extraction	
9	M	6/21	Lecture: Cloning and differential gene expression Deep dive: Cloning (Part 1)	DNA extraction lab report
10	T	6/22	Lecture: Cloning (Part 2) and Q&A	
11	W	6/23	Midterm Exam (lecture 1-7)	
12	R	6/24	Asynchronous: Watch <i>The Inventor: Out For Blood In Silicon Valley</i> and discuss it with your group	Film discussion recording (6/27)
13	M	6/28	Lecture: Reprogramming and induced pluripotent cells Deep dive: iPSC applications	
14	T	6/29	Lab: Foldscope 1	
15	W	6/30	Lab: Foldscope 2	
16	R	7/1	Lecture: CRISPR – Part 1 Discussion: Is science value neutral?	Read Lekka-Kowalik (2010)
17	M	7/5	Lecture: CRISPR – Part 2 Deep dive: CRISPR: Between saving lives and being a bioweapon	Foldscope lab report
18	T	7/6	Asynchronous: Watch <i>Jim Allison: Breakthrough</i> and discuss it with your group	Film discussion recording (7/6)
19	W	7/7	Q&A	Writing assignment
20	R	7/8	Final exam (lecture 9-17)	

* The PDFs of the articles as well as the URLs of the TED talk and documentaries will be posted on Canvas.