

## SCI 3102 Topics in Life Sciences

### Unraveling Inheritance: Searching for Meaning in Our Genes

#### Liberal Arts Department

Tuesdays 4:00-6:50  
Room 119, DeBruce Hall

#### Professor Contact Information

Karen Staehling, Ph.D.  
[kstaehling@kcai.org](mailto:kstaehling@kcai.org)

### Class Description

If you could read the 3 billion pairs of letters in your DNA, what story would they tell? Are you a descendant of royal bloodlines, or did you inherit faulty genes that predispose you to cancer? In the reproductive chromosome shuffle, will your kids inherit defective genes, or will they win the genetic lottery? And can we find secret clues to our ancient human ancestors hidden in our genome? In this course, students will learn how and what DNA can tell us about our traits, our ancestry, and our distant past. We will focus on the language of DNA and how it is inherited, read, interpreted, and sometimes misinterpreted or distorted. Topics include heredity, eugenics, ancestry DNA testing, ancient DNA and mutations.

We will also peer into our immediate future and the brave and promising new world that cutting-edge DNA technologies are ushering in. Can our DNA destiny be changed by diet, exercise, and a healthy environment or are we doomed to a life of errors in our code? With cheap DNA sequencing and powerful CRISPR gene editing, where is humankind headed and how are we changing life on our planet? Topics covered include epigenetics, chimeras, CRISPR-cas9, and genetically engineered organisms.

### Purpose of Course

My goals for this course are to help students nurture a curiosity for scientific discovery, to provide a solid background in modern DNA science, to give students the tools to evaluate scientific advances in their day to day lives and to improve critical thinking and communication skills. My purpose is not to turn KCAI students into mini scientists but to inspire students to be savvy scientific consumers and advocates for scientific data in a world of fake news and partisan politics.

*This course will fulfill a 3hr elective credit in the Sciences. It can also count for one of the two 3-credit hour liberal arts electives.*

### Liberal Arts Department Student Learning Outcomes

1. **Communication.** Demonstrate effective communication skills in written communication, in public speaking, and in active listening.
2. **Critical thinking.** Demonstrate critical thinking skills, including close reading, logical reasoning, and identification of bias. Ability to present multiple points of view with fairness and accuracy. Ability to find common ground in opposing perspectives.
3. **Inquiry.** Develop investigative skills sufficient to perform a creative and exhaustive search. Ability to identify and access all relevant sources.
4. **Creative problem-solving.** Develop problem-solving skills. Ability to find artistic solutions to intellectual problems and intellectual solutions to artistic problems.
5. **Cultural literacy.** Develop a level of cultural literacy necessary to be an informed global citizen through engagement with culture, language, and traditions, outside of home culture and language.
6. **Intellectual curiosity.** Develop an intellectual curiosity in the pursuit of living an examined life beyond one's lived experience.

## Course Learning Outcomes

Students will be able to:

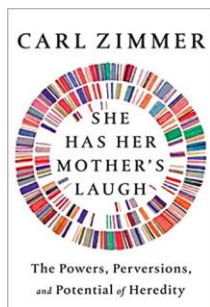
- Explain how the language of DNA is read, copied, expressed, analyzed, and interpreted to gain insights into human variation and life on earth.
- Demonstrate a basic understanding of how DNA encodes information and how that information is inherited from generation to generation.
- Identify and critique scientific issues relating to society or ethics by examining different perspectives, discerning arguments, evaluating data, and weighing these varied ideas in real-world situations.
- Effectively communicate and express scientific ideas & concepts verbally, digitally, and in writing.
- Create a video and a podcast that communicates scientific concepts learned in class to a general audience applying your artistic skills.
- Connect scientific knowledge and skills learned in class to their daily lives.
- Demonstrate the ability to draw conclusions, solve problems, and ask new questions based on observation, analysis, and critical thinking.
- Develop learning strategies and skills, including self-assessment to be able to learn more about biology and other fields in the pursuit of life-long learning.

## Course Design & Format

This course will be taught in person for the Spring 2024 semester. Students are first introduced to the topic for the week outside of class by reading assignments and occasional short assignments. Class time is spent reinforcing the material and covering new areas. I use a mixture of teaching approaches including traditional lectures, discussion, self-reflection, and active learning where students are actively doing something to improve their scientific skills and knowledge. Activities include problem solving, case studies, small group learning techniques and perhaps an experiment or two.

I've found the science background of students attending the class varies widely depending on their previous experience in Biology. Optional online quizzes are recommended to evaluate learning so that students don't fall behind. Extra material is also provided for students that need more help grasping a concept.

## Course Materials



Each week students will read 1 or 2 chapters from Carl Zimmer's book, *She Has Her Mother's Laugh: The Powers, Perversions, and Potential of Heredity* (~60-70 pages/week). Other course materials will be provided electronically through Google Classroom. Announcements are also posted in the stream of Google Classroom

## Examinations and Projects

Students will be demonstrating their learning through examinations and projects.

There will be **two examinations** of equal weight. The second exam is not designed to be comprehensive but will build upon and use knowledge learned in the first part of the course. Exams are based on the learning objectives for the week. The format is multiple choice and short answer. Here are the dates of the exams:

**Exam 1 (covers weeks 1-6): Tuesday, Mar 5**

**Exam 2 (covers weeks 8-14): Tuesday, May 7**

Students will also be creating **two media projects** this semester: a three-minute science video and a four-minute podcast on topics from the class. Detailed instructions for the media projects as well as a grading rubric and examples are on separate documents posted on Google Classroom. Here are the due dates for the projects:

**Video Project: Tuesday, February 27**

**Podcast Project: Tuesday, April 23**

## Attendance and Participation

In addition to the two exams and the projects, participation in classroom activities is necessary to successfully complete the course and will count toward students' grades in the course.

50	45	40	35	30	25	0
Attended 14 or more class sessions and thoughtfully participated in <b>all</b> in-class activities.	Attended 14 or more class sessions and thoughtfully participated in <b>some</b> in-class activities.	Attended 13 class sessions and thoughtfully participated in <b>all</b> in-class activities.	Attended 13 class sessions and thoughtfully participated in <b>some</b> in-class activities.	Attended 12 class sessions and thoughtfully participated in <b>all</b> in-class activities.	Attended 12 class sessions and thoughtfully participated in <b>some</b> in-class activities.	Attended fewer than 12 class sessions.
<b>Consistently</b> contributed to discussion and was prepared for class.	<b>Occasionally</b> contributed to discussion and was prepared for some classes.	<b>Consistently</b> contributed to discussion and was prepared for class.	<b>Occasionally</b> contributed to discussion and was prepared for some classes.	<b>Consistently</b> contributed to discussion and was prepared for class.	<b>Occasionally</b> contributed to discussion and was prepared for some classes.	

## Grading

	% of Grade	Points
Exam 1	22%	100
Exam 2	22%	100
Video Project	22%	100
Podcast Project	22%	100
Participation/Attendance	11%	50
TOTAL	100%	450

**This is the grading scale I will be using:**

Points	Grade	%
423	A	94%
405	A-	90%
392	B+	87%
374	B	83%

360	B-	80%
347	C+	77%
329	C	73%
315	C-	70%
302	D+	67%
270	D	60%
<270	F	0-59%

## Course Schedule

Week	Name of Week	Date	Note
1	Class Intro DNA Intro	Jan 23	
2	Peas, Cats & Pedigrees	Jan 30	
3	Eugenics Deep Dive and the DNA Double Helix Revisited	Feb 6	
4	Meet DNA's cousin RNA and Discover the Advantages of Sex (from a biological perspective ;)	Feb 13	
5	Ancestry Testing & DNA Profiling	Feb 20	
6	The genome of Individual Z	Feb 27	Video project due
7	Exam 1 (Weeks 1-6)	Mar 5	Peer assignments emailed on Mar 6
Spring Break			
8	What DNA Can Tell Us About Race and Our Origins	Mar 19	Peer reviews due
9	Complex Traits Meets Human's Best Friend	Mar 26	Fri, Mar 22- Midterm grades posted
10	The Family Tree Inside of Us	Apr 2	
11	Chimeras, Cancer, Mosaics and the Marvelous World of Science Oddities and Mysteries	Apr 9	Apr 12th- BFA opening
12	Our Microbial Zoos and Encoding Experiences into our Epigenome	Apr 16	
13	Genetically Modified Organisms & CRISPR Gene Editing	Apr 23	Podcast projects due
14	Human Gene Editing, Gene Drives, and the Brave New Tech Frontier	Apr 30	Fri, May 3- End of semester show begins. Peer assignments emailed on May 1
15	Exam 2 (Weeks 8-14)	May 7	May 10- Last day of the semester Podcast reviews due

## **Expectations of Students & Class Policies**

Students should be prepared to spend ~9 hours per week on the course. Typically, a 3-hr elective course in the Liberal Arts Department requires 3 hrs. of in class time per week plus 6 hrs. of outside time hence the 9 hours.

Students are expected to conduct themselves professionally and interact with their peers in a collegial manner. Cell phones should be on silent mode or off and not used in class except for emergencies or to look up information if required by the class. Food and drinks are permitted in class if they don't interfere with class activities.

### **Course Attendance Policy**

As indicated in the table above, attendance and class participation are a required component of this course and count toward students' grades. Students can miss one class without it affecting their grade. Students are responsible for catching up on the material covered in a missed class. In general students that miss more than 3 classes struggle in the course as well as receive zero points for attendance and participation.

If you are more than 15 minutes late to class on two separate occasions it will count as an unexcused absence. If you leave early by more than 15 minutes on two separate occasions it will count as an unexcused absence.

### **Late Work Policy**

The video and podcast projects need to be turned in on the due date for full credit. Late projects can be turned in up to one week late for partial credit. After the initial due date, I'll take 5pts off per day until the project is turned in. After one week, students will receive 0 points for the project. If you have a family emergency or are sick, please contact me ASAP.

In general exams are not accepted late. If you are sick or have a family emergency, please contact me ASAP and before the exam date. Students need to arrange a time to take the makeup exam with the instructor. Students will have a week to make up for the missed exam.