HUMAN BIOLOGY: EPIGENETICS, GENETICS AND EVOLUTION
BIO346, SUMMER 2019

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Meeting times: M-Th, 11:45-1:45pm
Office hours: M, W 2-3pm

This is a fun but challenging course that surveys molecular and evolutionary underpinnings of human biology. The course is intended as a broad summary and synthesis of diverse areas of biology with an emphasis on its unifying themes. Exams emphasize integration and application of concepts, and are designed to mimic the range of questions students can expect to find on pre-professional exams, like the Medical College Admissions Test. Our major learning objectives are to:

- Understand the molecular basis of interactions between genomes and environments
- Understand how societal factors (poverty, stress, trauma) influence genome function
- Understand genetic contributions to health and disease
- Describe how human movements have shaped genetic variation
- Detect evidence of natural selection within the genome
- Understand how selection and mutation shape health and disease
- Identify the relationship between the human body and its homologs in other species
- Understand the continuity of biological processes across timescales

The material of the course is organized into three broad themes: 1. **Epigenetics, genetics and society**. 2. **Human diversity**, and 3. **Becoming human**. The class will use principles of biology that are derived from work with many species and apply them to understanding human form and function. The first theme, *Epigenetics, genetics and society*, discusses how our experience in the world interacts with our genome. *Human diversity* explores concepts of geographic variation, population evolution and recent human history. The last theme, *Becoming human*, moves progressively farther back in time to understand the origins of the structure of our bodies and the cells that comprise them. The class assumes **students having successfully completed the pre-requisite course BIO325, or its equivalent** (or ANT 301 for students enrolled in ANT 348K). To evaluate your understanding, there will be three in-class exams, three quizzes, and a variety of active learning activities related to excursions. Grades will be weighted as follows.

Exam 1,	Thursday, June 4	100pts
Exam 2,	Monday, June 22	100pts
Exam 3,	Thursday, July 2	100pts
In-class activities and quizzes		100pts
	Attendance, participation, in-class work 50pts	
	Excursion-related activities, 50pts	
Total		**400pts**

Scores on tests are curved. We will calculate the curve by averaging the top two scores in the class, subtracting the average from 100, and adding the difference to everyone's exam scores. The total percentage of correct items will be converted into letter grades using the familiar standards: A = 90.0-100, B = 80.0-89.9, C = 70.0-79.9, and D = 60.0-69.9.

The course reading is a mixture of scientific and popular press articles distributed as *pdf* files. These *pdfs* are available in the course Canvas site. Underlined readings are original scientific papers (so allow more time to get through them). Items in blue refer to excursions.

Date	Theme 1: Epigenetics, genetics & society	Student reading
T, 5/26	Arrival, dinner	Taladrid 2019, Wilfird 2012
W, 5/27	Orientation, Santander excursion	Mukherjee 2016, Bonetta 2008,
Th, 5/28	Epigenetics, poverty & trauma	Barker 1990, Sapolsky 2005
F, 5/29	Excursion: The caves of Cantabria	
M, 6/1	Transgenerational epigenetics	Rando 2015, Heijmans et al 2008
T, 6/2	Heritability, mutation and association	Wray 2008, Kruglyak 2008
W, 6/3	GWAS, "missing heritability" & PRS	Maher 2008, Reznick 2018
Th, 6/4	**Exam 1**	
	Theme 2: Human diversity	
M, 6/7	Holiday	
T, 6/9	Drift & migration: The movement of people	Cavalii-Sforza 1969 Barbujani and Colonna 2010 Zimmer 2019
W, 6/10	Selection interacts with neutral forces	Schaffer 2008
Th, 6/11	Selection & agriculture	Curry 2013
M, 6/15	Selection & skin color	Jablonski and Chaplin 2003, Shriver et al 2007
T, 6/16	Two million years of culture: the genus *Homo*	Pontzer 2012, Mooallem 2017
W, 6/17	Excursion: Atapuerca & Museum of Human Evol	
Th, 6/18	*Review*	
M, 6/22	**Exam 2**	
	Theme 3: Becoming human	
T, 6/23	Big brains and phylogeny: Homo and beyond	Pollard 2009, Boyd Silver 2015
W, 6/24	Tetrapod limbs to opposable thumbs	Riddle & Tabin 1999
Th, 6/25	Limbs continued	Prabhakar Noonan 2008
Th-Su, 6/25-6/28	Overnight Excursion: Madrid, National Museum of Archaeology, National Museum of Natural Sciences	
M, 6/29	Faces and jaws	Sheehan Nachmann 2014
T, 6/30	Tissues, cells & nuclei	Mattiroli Luger 2017
W, 7/1	*Review*	
Th, 7/2	**Exam 3**	