

Biology 335: Genetics (Winter 2018)

Lectures/Discussions: Monday, Tuesday, Wednesday, and Thursday, 5th hour, SMC A-210

Instructor: Rose Keith

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Office hours: Monday and Wednesday 4th hour, Thursday 6th hour, or by appointment

Textbook: Genetics: a conceptual approach (Sixth Edition), Benjamin A. Pierce

Course description: This course examines genetic inheritance in model organisms and in humans by exploring the experiments that lead to our current understanding of the field. Discussion-based, primary literature centered classes are the foundation for the course.

Course objectives:

1. To understand patterns and mechanisms of inheritance in individuals and populations.
2. To understand the use of genetics as a means of understanding the relationships between genotype and phenotype, in both model organisms and humans.
3. To understand the history of the field of genetics, and how major concepts and methods have changed over time.
4. To be able to read, discuss, and analyze primary literature in genetics.

All class materials, including readings, problem sets, and lecture powerpoints, will be posted on Moodle. The schedule on Moodle will be updated to reflect any changes.

Laptop note: Using laptops in class is allowed; however, there is a significant body of research that shows that most students don't learn as well when they take notes on laptops, and so I discourage you from doing so. I know that printing all of the readings can get expensive, so laptops or tablets will be allowed during paper discussions; however, if you get distracted your participation grade will suffer.

Course requirements:

Exams: We will have two mid-term tests and a cumulative final exam. They will focus on in-class material and your ability to solve problems in genetics.

Attendance/Participation: As this is largely a discussion-based course, attendance and participation are necessary. An unexcused absence will result in a zero for participation for the day. Absences due to illness or sporting events are excused; in the case of other extraordinary circumstances that cause you to miss class, please contact me. Participation grades will be based on being active and attentive during discussions and in-class activities. It is essential that

you read papers **carefully and thoroughly** before discussions; for each paper there will be a worksheet or a few questions to complete before class and hand in, which will count towards your participation grade. Days in which we have discussions will be worth twice as many participation points as lecture class sessions.

Paper presentations: You will practice leading paper discussions in small groups. Each group will choose a paper on a topic that interests them and will lead a ~30 minute class discussion of it. Areas of interest could include a specific disease, model organism, or technique that you'd like to learn more about. The discussion should help other students connect the paper to other concepts we've discussed in class.

Pre-class questions: These will be due by 9 AM on Monday and Wednesday of each week. These will be short assessments (about 10 minutes) on Moodle, and will be graded based on completion. The two lowest will be dropped.

Problem sets: There will be six problem sets due. These will focus on applying skills discussed in class.

The course grade will be determined by:

Participation	25%
Midterm 1	12%
Midterm 2	12%
Final	16%
Leading the discussion	15%
Problem sets	15%
Pre-class questions	5%

Readings

Cadiou *et al.* 2009. Coat variation in the domestic dog is governed by variation in three genes. *Nature* 326 (150-153).

Crick *et al.* 1961. General nature of the genetic code for proteins. *Nature* 192 (1227-32).

Haworth *et al.* 2010. The heritability of general cognitive ability increases linearly from childhood to young adulthood. *Molecular Psychiatry* 15 (1112-1120).

He *et al.* 2003. Regulation of flowering time by histone acetylation in *Arabidopsis*. *Science* 302 (1751-1754).

Johnson *et al.* 2004. *Arabidopsis hapless* mutations define essential gametophytic functions. *Genetics* 168 (971-982).

Juron *et al.* 2011. Chromosomal rearrangements maintain a polymorphic supergene controlling butterfly mimicry. *Nature* 47 (203-208).

Mendel. Experiments in Plant Hybridization. Verhandlungen des naturforschenden Vereines in Brünn, Bd. IV für das Jahr 1865, Abhandlungen, 3-47.

Sturtevant. 1913. The linear arrangement of six sex-linked factors in *Drosophila*, as shown by their mode of association. *Journal of Experimental Biology* 14 (43-59).

Weber et al. Discrete genetic modules are responsible for complex burrow evolution in *Peromyscus* mice. *Nature* (2013) vol. 493 pp. 402-405.

Wellcome Trust. 2007. Genome-wide association study of 14,000 cases of seven common diseases and 3,000 shared controls. *Nature* 447 (661-678).

Tentative Schedule (subject to change):

		Textbook	Reading	Assignments
3-Jan	Intro			
4-Jan	Mendel	p. 9-12	Mendel	
8-Jan	Mendel	Ch 3	Mendel	
9-Jan	Mendel +	Ch 5, 147-150		
10-Jan	Mendel +	Ch 3, 5	Cadieu	
11-Jan	Chromosomes	Ch 2 (skim)		1 st PS due
15-Jan	Chromosomes	Ch 4, 150-153		
16-Jan	Chromosomes	Ch 7		
17-Jan	Linkage and mapping	Ch 7		
18-Jan	Linkage and mapping	Ch 7	Sturtevant	
22-Jan	Linkage and mapping	Ch 8		2 nd PS due
23-Jan	Chromosomal abnormalities	Ch 8		
24-Jan	First Exam			
25-Jan	Chromosomal abnormalities	Ch 10	Juron	
29-Jan	DNA	Ch 10		
30-Jan	DNA	Link in Moodle		
31-Jan	Genetic analyses		Crick	
1-Feb	Genetic analyses	p. 622-623, p.		3 rd PS due
5-Feb	Genetic analyses		Johnson	
6-Feb	Gene Regulation	Ch. 17		
7-Feb	Gene Regulation		He	
8-Feb	Altering genomes	p. 564-567, 589-597		4 th PS due
12-Feb	Population genetics	Ch 25		
13-Feb	Population genetics	Ch 25		
14-Feb	Second exam			
15-Feb	Population genetics	Ch 25		
19-Feb	Population genetics			
20-Feb	Complex traits/human genetics	Ch 24		5 th PS due
21-Feb	Complex traits/human genetics	Ch 24.3		
22-Feb	Complex traits/human genetics		Haworth	
26-Feb	Complex traits/human genetics	p. 198-201		
27-Feb	Complex traits/human genetics		Wellcome Trust	
28-Feb	Complex traits/human genetics			
1-Mar	Paper discussions		TBA	6 th PS due
5-Mar	Paper discussions		TBA	
6-Mar	Paper discussions		TBA	
7-Mar	Paper discussions		TBA	

Final Exam— Date TBA