Anthro 5221 & Biol 5221
Lecture: MWF 10:45–11:35AM
Lab: F 1–3PM
Profs: Alan Rogers, Jon Seger

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OSH 102
1120 Marriott Library
TAs: Ryan Bohlender, Emily DiBlasi

`http://content.csbs.utah.edu/~rogers/ant5221/index.php`

Human Evolutionary Genetics

Description Theories and methods of molecular population genetics, with emphasis on human examples. How DNA sequence variation is analyzed to infer population history and to identity genes recently subject to selection. Laboratory exercises develop elementary programming skills using Python to show how computation is used in research to connect models and data. Satisfies Quantitative Intensive Requirement.

Prerequisites You should be comfortable with algebra and first-semester calculus. No prior knowledge of Python is needed.

Grading two midterm exams and a cumulative final (17% each), weekly labs (25% total), and weekly homeworks (25% total). Grades are curved as explained on the website.

Exams are paper-and-pencil and take place in the lecture room. You may bring one 3X5 card containing handwritten notes on both sides. You may bring a calculator, but do not load notes onto the calculator.

Weekly computer lab In this lab, students do projects using the Python computer language. The lab assignments are intended to be short enough to complete within the duration of the two-hour computer lab. The lab syllabus is available on class web site listed above. The projects themselves are described in *Lab Manual for Anth/Biol 5221*, which is also available on the website or the Copy Center at Olpin Student Union.

Homework There are also paper-and-pencil homework assignments, which are due at roughly weekly intervals as indicated in the syllabus below. The homework assignments are available on the class website or the Copy Center at Olpin Student Union. The answers to even-numbered problems are given in the back of the book of assignments.

Required readings are listed in the outline below and in the list of references. The main text,

> Gillespie, John. 2004. *Population Genetics, a Concise Guide*, 2nd edition

is available at the bookstore. All other readings are on the class website. In addition, we will occasionally assign other published papers and notes of our own. When we do, they will be available either on paper or on the course web site.

Recommended readings Hetland, Magnus L. 2005. *Beginning Python: From Novice to Professional*, 1st Edn. If you are rusty at algebra, work your way through Ch. 2 of *Precalculus Mathematics in a Nutshell*, by George Simmons, which is available on the class website.

Contact All of us are available after class and by appointment.

TAs: *Bohlender*: 206 Stewart, ryan.bohlender at anthro dot utah dot edu; *DiBlasi*: 570 ASB, 801-585-9748, DiBlasi dot Emily at gmail dot com; **Profs:** *Rogers*: 206a Stewart, 801-581-5529, rogers at anthro dot utah dot edu; *Seger*: 322 Biol, 801-581-4758, seger at biology dot utah dot edu.

Discussion list All students should enroll in the class email list, which is a place to ask questions about the course (and also to answer them). We often use the list for important announcements involving review sessions, homework, and exams. To enroll, point your browser at `http://lists.csbs.utah.edu`, and follow the link to `EvGen`. To post a question to the list, you must use the email account with which you enrolled in the list. Just send your question by email to `evgen@lists.csbs.utah.edu`.

Study sessions We will staff two study sessions per week, both in Room 103B of Stewart Building (just North of Pioneer Memorial Theater). Emily DiBlasi will run a study session at 9 AM Monday and Ryan Bohlender will run one at 10 AM Thursday.

Equal access provisions The University seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, then reasonable prior notice must be given to the instructor and to the Center for Disability Services, 162 Olpin Union. Call 581-5020 to make arrangements.

Date		Lecture	Reading	
Aug	25 M	Introduction to the course, and to variation	RS	
	27 W	Describing and partitioning phenotypic variation	S	
	29 F	Genomes and their variation	S	[3, sec. 1.0–1.3]
Sep	01 M	*** NO CLASS		
	03 W	Probability 1	R	[11, sec. 1–2]
	05 F	Probability 2	R	[11, sec. 3]
	08 M	Probability 3	R	[11, sec. 3]
	10 W	Python	S	[14]
	12 F	Random mating	R	[3, sec. 1.4]
		Homework 1 due.		
	15 M	Genetic drift and heterozygosity	R	[3, sec. 2.0–2.2; 12, Ch. 1]
	17 W	Mutation versus drift	R	[3, sec. 2.3; 12, Ch. 1]
	19 F	DNA sequence variation	R	[12, Ch. 1]
		Homework 2 due.		
		Homework 3 due.		
	22 M	Gene genealogies	R	[12, Ch. 4]
	24 W	Catch-up and review		
	26 F	Exam 1		
	29 M	Connecting gene genealogies to genetics	R	[12, Ch. 5; 3, sec. 2.6]
Oct	01 W	Site frequency spectrum	R	[12, Ch. 6]
	03 F	Molecular evolution	S	[3, sec. 2.4]
		Homework 4 due.		
	06 M	Mismatch distribution	R	[12, Ch. 7]
	08 W	Population growth and gene genealogies	R	[4]
	10 F	Molecular variation and neutral theory 1	S	[3, sec. 2.5]

		Homework 5 due.			
	13 M	⋆⋆⋆ NO CLASS			
	15 W	⋆⋆⋆ NO CLASS			
	17 F	⋆⋆⋆ NO CLASS			
	20 M	Molecular variation and neutral theory 2	S	[3, sec. 2.5]	
	22 W	Selection 1	S	[3, sec. 3.0–3.3]	
	24 F	Selection 2	S		
		Homework 6 due.			
	27 M	Mutation versus selection	S	[3, sec. 3.4; 2]	
	29 W	Genetic load	S	[3, sec. 3.5]	
	31 F	Fixation of advantageous mutations	S	[3, sec. 3.9–3.10]	
		Homework 7 due.			
Nov	03 M	Two-locus dynamics	R	[3, sec. 4.0–4.1]	
	05 W	Catch-up and review			
	07 F	Exam 2			
		Homework 8 due.			
	10 M	Two-locus selection	R	[3, sec. 4.2]	
	12 W	Genomic traces of selective sweeps	R	[13; 10]	
	14 F	Inbreeding 1	R	[3, sec. 5.0–5.3]	
		Homework 9 due.			
	17 M	Inbreeding 2	R		
	19 W	Genetic draft	S	[3, sec. 4.3]	
	21 F	Population history from whole genomes	R	[5]	
		Homework 10 due.			
	24 M	Lactase persistence and pastoralism	R	[1]	
	26 W	Population subdivision	R	[3, sec. 5.5; 9]	
	28 F	⋆⋆⋆ NO CLASS			
Dec	01 M	Archaic admixture	R	[6, 15]	
		Homework 11 due.			
	03 W	Quantitative Genetics: genes and environment	S	[3, sec. 6.0–6.1]	
	05 F	Quantitative Genetics: heritability	S	[3, sec. 6.2]	
		Extra credit assignment due.			
	08 M	Quantitative Genetics: evolution in nature	S	[3, sec. 6.3]	
	10 W	QTL mapping and "missing" heritability	S	[8, 7]	
	12 F	Catch-up and review			
		Homework 12 due.			
Dec	15 M	**Final exam** 10:30AM–12:30PM			

References

[1] Todd Bersaglieri, Pardis C. Sabeti, Nick Patterson, Trisha Vanderploeg, Steve F. Schaffner, Jared A. Drake, Matthew Rhodes, David E. Reich, and Joel N. Hirschhorn. Genetic signatures of strong recent positive selection at the lactase gene. *American Journal of Human Genetics*, 74:1111–1120, 2004.