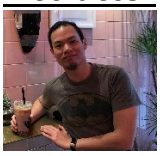
BIOL321: Foundations of (~~Human Evolutionary~~) Genetics

Spring 2023
TR 10:30 am – 11:50 am, Magruder Hall 1090

Instructor



An-Di Yim
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Office hours: M @ 1:30 pm – 3:30 pm, TR @ 9:00 am – 10:30 am, additional time by appointment.

Textbook & Course Resource Information

Required Reading Material

Jobling et al. 2014. Human Evolutionary Genetics, 2nd edition. Garland Science, ISBN: 9780815341482

Required Reading Material (Free materials)

PDFs of required journal articles and book excerpts will be available on the course website.

Blackboard

All course information is managed on Blackboard (http://blackboard.truman.edu/).

Course resources may be found at:
Truman Bookstore: https://www.bkstr.com/trumanstatestore/home
Truman Library: http://library.truman.edu/

Minimum Technology Requirements

- HARDWARE: Macintosh (OS X 10.6 or higher) or Windows computer (Vista or higher), with Intel processor, 1 GB disk space and 512 MB RAM.
- SOFTWARE: A word processing programs, Microsoft PowerPoint for compatible viewer, Abobe Acrobat Reader, a web browser (Internet Explorer, Firefox, or Chrome for Window computers and Firefox, Chrome, or Safari for Apple computers).
- Broadband Internet connection is required.

Course Description

This course surveys the patterns of genetic variation within and between human populations and explores the evolutionary forces that have contributed to these patterns. We examine the architecture of the human genome, the technologies used to detect genetic variation in the genome, and the consequences of genetic variation. We discuss evolutionary models that can be used to explain the patterns we identify. In addition, we consider the cultural, ethical and social implications of genomic research with humans.

Learning Objectives and Course Schedule

Upon completion of this course, students will be able to:

1. Demonstrate an understanding of the principles of transmission, molecular and evolutionary genetics.
2. Explain how gene interaction and the environment can affect a phenotype.
3. Apply core genetics concepts to understand current genetic issues.
4. Critically evaluate the methods and data presented in primary literature.

Course Schedule

Week	Date	Topic(s)
1	1/17	**Course overview, how to read a journal article**
	1/19	**Introduction to genetics and genomics**
2	1/24	**Bioethics, Eugenics** *Readings* • Lombardo, P. A. (2018). *Genetics in Medicine*, 20(11), 1305-1311.
	1/26	**Inheritance** *Readings* • Jobling, et al. (2014). Chapter 2.
3	1/31	**Human genome variation** *Readings* • Jobling, et al. (2014). Chapter 3.
	2/2	**Biotechnology** *Readings* • Jobling, et al. (2014). Chapter 4.
4	2/7	**Introduction to infographic assignment** **Forces of evolution** *Readings* • Jobling, et al. (2014). Chapter 5.
	2/9	**Mutation** *Readings* • Sauna, Z. E., & Kimchi-Sarfaty, C. (2011). *Nature Reviews Genetics*, 12(10), 683-691. • Alexandrov, L. B., et al. (2013). *Nature*, 500(7463), 415-421.
5	2/14	**Natural selection** *Readings* • Jobling, et al. (2014). Chapter 6 (Section 6.7). • Hurst, L. D. (2009). *Nature Reviews Genetics*, 10(2), 83-93.
	2/16	Infographic assignment working day (**NO CLASS**)

6	2/21	**Genetic drift** *Readings* • "Genetic Drift: Evolution at Random" in Futuyma, D., & Kirkpatrick, M. (2017). *Evolution*. Sinauer. Sunderland, MA. • Weaver, S. C., et al. (2021). *Nature Reviews Microbiology*, 19(3), 184-195.
	2/23	**Discussion: biotechnology and its impacts** *Readings* • Uddin, F., et al. (2020). *Frontiers in oncology*, 10, 1387. • Piergentili, R., et al. (2021). *Cells*, 10(5), 969. • Rozas, P., et al. (2022). *Biological Research*, 55. **Review**
7	2/28	**EXAM 1** (online, **NO CLASS**)
	3/2	**Inferences of genetic diversity** *Readings* • Jobling, et al. (2014). Chapter 6 (Section 6.1 – 6.6).
8	3/7	**Simple genetic diseases** *Readings* • Jobling, et al. (2014). Chapter 16. **Infographic assignment DUE**
	3/9	**Evolution of complex diseases** *Readings* • Jobling, et al. (2014). Chapter 17.
9	3/14	**NO CLASS**
	3/16	**NO CLASS**
10	3/21	**What makes us human?** *Readings* • Jobling, et al. (2014). Chapter 7. • Jobling, et al. (2014). Chapter 8 (Section 8.2 and 8.3)
	3/23	**Human demographic history** *Readings* Jobling, et al. (2014). Chapter 9.
11	3/28	**Ancient DNA in modern human genome** *Readings* • Koller, D., et al. (2022). *BMC biology*, 20(1), 1-15. • Dolgova, O., & Lao, O. (2018). *Genes*, 9(7), 358. • Wolf, A. B., & Akey, J. M. (2018). *PLoS genetics*, 14(5), e1007349.
	3/30	**Genotype-phenotype relationships** *Readings* • Uffelmann, E., et al. (2021). *Nature Reviews Methods Primers*, 1(1), 1-21. • Tam, V., et al. (2019). *Nature Reviews Genetics*, 20(8), 467-484.

12	4/4	**Epigenetics** *Readings* • Cavalli, G., & Heard, E. (2019). *Nature*, 571(7766), 489-499. • Berdasco, M., & Esteller, M. (2019). *Nature Reviews Genetics*, 20(2), 109-127.
	4/6	**Introduction to final project** **Discussion: evolutionary medicine** *Readings* • Prohaska, A., et al. (2019). *Cell*, 177(1), 115-131. • Quintana-Murci, L. (2019). *Cell*, 177(1), 184-199. **Review**
13	4/11	**EXAM 2** (online, **NO CLASS**)
	4/13	**Human population structure, race and racism** *Readings* • Jobling, et al. (2014). Chapter 10.
14	4/18	**Race and genetics** *Readings* • Batai, K., & Kittles, R. A. (2013). *Race and Social Problems*, *5*(2), 81-87. • Kaplan, J. M., & Fullerton, S. M. (2022). *Philosophical Transactions of the Royal Society B*, 377(1852), 20200427.
	4/20	**Genetic identification** *Readings* • Jobling, et al. (2014). Chapter 18.
15	4/25	**Discussion: behavioral genetics and recent events** *Readings* • Sniekers, S., et al. (2017). *Nature genetics*, 49(7), 1107-1112. • Lee, J. J., et al. (2018). *Nature genetics*, 50(8), 1112-1121. • Okbay, A., et al. (2022). *Nature genetics*, 54(4), 437-449. • Cerdeña, J. P., et al. (2022). *Human Genomics*, 16(1), 1-5.
	4/27	**NO CLASS**
16	5/2	**FINAL PRESENTATION**
	5/4	**FINAL PRESENTATION**

Exams, Assignments, and Grading

EXAMS	**2*50 pts**	**100 pts**
ATTENDANCE		**25 pts**
IN-CLASS ACTIVITIES		**50 pts**
QUIZZES	**10*5 pts**	**50 pts**
INFOGRAPHIC ASSIGNMENT		**50 pts**
FINAL PRESENTATION	**PEER EVALUATION**	**25 pts**
	INSTRUCTOR EVALUATION	**50 pts**
TOTAL		**350 pts**

Exams:

This course will have **2** exams. Exams will be held online on **2/28** and **4/11**. Each exam is worth 50 points total. There is no final exam for this course.

Attendance and in-class activities:

Because this is a small class, attendance is *mandatory*. However, I understand life happens, so you are allowed two absences, no questions asked. If possible, please let me know ahead of time if you will not be in class. Any additional absences will have an effect on your final grade unless they are accompanied by an acceptable excuse as defined by the university. A list of sanctioned absences can be found in the General Catalog at http://catalog.truman.edu/. The professor reserves the right to deem additional absences as unsanctioned once a student has missed 6.67% of class time for sanctioned absences.
In-class activities include in-class experiments, worksheets, short reflection papers, and discussions. In-class experiments will be graded for completion, written forms of in-class activities will be collected at the end of class period or (if we didn't finish them in time) at the beginning of the next class, and discussion will be graded for participation.

Assignments and Quizzes:

Quizzes: there will be at least 10 unannounced take home quizzes throughout the semester. Each quiz is worth 5 points. All quizzes are open-book, and you should complete them before the next class. Generally, quizzes will focus more on the reading materials.
Infographic assignment: During the first half of the semester, students will work in pairs to complete an infographic on a topic related to the basic concepts in human (evolutionary) genetics. More information will be available mid-semester.
Final presentation: During the second half of the semester, students will work in groups to complete a final presentation on a topic related to the ethical, legal, and social implications of genomic research. The presentation should be about 15 to 20 minutes. More information (including a list of topics) will be available mid-semester.

Grading Policy:

Grading scale:

A ≥ 90% B = 80% to 89% C = 70% to 79% D = 60% to 69% F ≤ 59%

Late work: **There is a zero-tolerance policy for late work**. There will be no extensions or exceptions. Late work receives a zero.

Course Expectations and Resources

Response Time and Feedback:

I will do my best to respond to emails as soon as possible between 8:00 am and 5:00 pm Monday through Friday. Usually a reply can be expected within 24 hours. If it is something urgent, you are always welcome to stop by my office as I am usually there. I will have office hours in which you can ask questions or review materials. I will not respond to emails late the night before the exam or before an assignment is due. It is my goal to have time to give consideration to all of your questions, and to meet with all of you when you need to meet.

Feedback: Exams or assignments will be graded within a week from the day they are due.

Substantive Interaction:

Truman policy and federal regulations require that students demonstrate that they are academically engaged in the courses they take. You must meet this requirement within the first calendar week of the semester, beginning at 12:00 am on Tuesday (1/17/2023) and ending 11:59 pm Saturday (1/21/2023). Failure to do so, or to provide an explanation of an extenuating circumstance by that date and time will result in your removal from the course. Under certain circumstances, removal could impact your scholarship eligibility or financial aid. For the purposes of this class, establishing academic engagement requires, at a minimum, **completing the introduce yourself assignment on Blackboard before 00:00 AM on 1/19/2023.**

Credit Hour Justification:

The minimum investment of time by the average Truman student necessary to achieve the learning goals in this course are not less than one hour (50 minutes) of classroom instruction and a minimum of two hours of out of class student work each week per credit hour awarded or at least the equivalent of three hours (2:50) of laboratory work, internships, practica, and other academic work each week per credit hour awarded. This average time per week for an average student may have weekly variations. For this course, students should expect to spend an additional 2 to 4 hours outside of class in order to be successful.

Academic Dishonesty:

The General Catalog states:

Students are expected to do their own academic work, this includes cite your sources and not plagiarize. Any student involved in cheating on a paper, an examination or in any other form of academic dishonesty is subject to disciplinary action, including suspension or expulsion from the class, the student's academic program, or the University.

More information can be found in the General Catalog at http://catalog.truman.edu/ and the Student Conduct Code Section 8.050.1 at https://www.truman.edu/wp-content/uploads/2018/08/CHAPTER-8-REVISED-August-4-2018.pdf.

FERPA:

Education records are protected by the Family Education Right to Privacy Act (FERPA).More information can be found at: http://www.truman.edu/registrar/ferpa/. Course grades, assignments, advising records, etc. cannot be released to third parties without your permission. There are, however, several exceptions about which you should be aware. For example, education records can be disclosed to employees or offices at Truman who have an "educational need to know". These employees and offices may include your academic advisor, the Institutional Compliance Officer, the Registrar's Office, or Student Affairs depending on the type of information.

Disruptive behavior:
"Behavior that persistently or flagrantly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be asked to leave class pending discussion and resolution of the problem" and may be reported to the Office of Citizenship and Community Standards. *(Quotation from Washington State University).*

Mask Policy:
Consistent with guidance for higher education institutions from the Centers for Disease Control and to help us reduce the possible spread of COVID-19, requirements to wear a mask will follow University-wide policy for all in-person course meetings. When a mask mandate is in place, you will be expected to keep the covering on at all times that covers your mouth and nose. During office hours, you will be required to wear a face covering. In the event you are without a face covering, you will be asked leave until you are able to obtain one and return. In the event that the campus-wide mask mandate is relaxed, individuals who have not been fully vaccinated or have underlying medical conditions that increase their risk for infection are strongly encouraged to wear a mask on campus.

University-Wide Resources and Procedures

Disability Services:
To obtain disability-related academic accommodations students with documented disabilities must contact the course instructor and the Office of Student Access and Disability Services (OSA) as soon as possible. Truman complies with ADA requirements. For additional information, refer to the Office of Student Access and Disability Services website at https://disabilityservices.truman.edu/. You may also contact OSA by phone at (660) 785-4478 or studentaccess@truman.edu.

Emergency Procedures:
In each classroom on campus, there is a poster of emergency procedures explaining best practices in the event of an active shooter/hostile intruder, fire, severe weather, bomb threat, power outage, and medical emergency. This poster is also available as a PDF at this link: http://police.truman.edu/files/2015/12/Emergency-Procedures.pdf .Students should be aware of the classroom environment and note the exits for the room and building. For more detailed information about emergency procedures, please consult the Emergency Guide for Academic Buildings, available at following link: http://police.truman.edu/emergency-procedures/academic-buildings/

This six-minute video provides some basic information on how to react in the event there is an active shooter in your location: http://police.truman.edu/emergency-procedures/active-shooter/active-shooter-preparedness-video/.

Truman students, faculty, and staff can sign up for the TruAlert emergency text messaging service via TruView. TruAlert sends a text message to all enrolled cell phones in the event of an emergency at the University. To register, sign in to TruView and click on the "Truman" tab. Click on the registration link in the lower right of the page under the "Update and View My Personal Information" channel on the "Update Emergency Text Messaging Information" link. During a campus emergency, information will also be posted on the TruAlert website http://trualert.truman.edu/.

Discrimination and Title IX:
Truman State University, in compliance with applicable laws and recognizing its deeper commitment to equity, diversity and inclusion, which enhances accessibility and promotes excellence in all aspects of the Truman Experience, does not discriminate on the basis of age, color, disability, national origin, race, religion, retaliation, sex (including pregnancy), sexual orientation, or protected veteran status in its programs and activities, including employment, admissions, and educational programs and activities. Faculty and staff are considered "mandated reporters" and therefore are required to report potential violations of the University's Anti-Discrimination Policies to the Institutional Compliance Officer.

Title IX prohibits sex harassment, sexual assault, intimate partner violence, stalking and retaliation. Truman State University encourages individuals who believe they may have been impacted by sexual or gender-based discrimination to consult with the Title IX Coordinator who is available to speak in depth about the resources and options. Faculty and staff are considered "mandated reporters" and therefore are required to report potential incidents of sexual misconduct that they become aware of to the Title IX Coordinator.

For more information on discrimination or Title IX, or to file a complaint contact:

Ryan Nely, Institutional Compliance Officer, Title IX and Section 504 Coordinator
Office of Institutional Compliance
Violette Hall, Room 1308
100 E. Normal Ave
Kirksville, MO 63501
Phone: (660) 785-4354
titleix@truman.edu

The institution's complaint procedure can be viewed at:
http://titleix.truman.edu/files/2015/08/University-Complaint-Reporting-Resolution-Procedure.pdf and the complaint form is accessible at http://titleix.truman.edu/make-a-report/