

BIOL B317: Evolution and Medicine

Dr. Adam Williamson Office: Park 212 Email: awilliams6@brynmawr.edu	Seminar: Mon, Wed. 11:40 am – 1:00 pm Park Science Room 264 Office Hours (Park 212): Mon 1:10p – 2p; Thurs 9:45a – 10:30a
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OVERVIEW

An opportunity to apply evolutionary thinking to the prevention and treatment of human disease. Course themes include: pathogen evolution; evolution of defense mechanisms; reproductive medicine; cancer as an evolutionary process; reproductive medicine; horizontal gene transfer; evolutionary medicine in the age of genome editing. A seminar course with an emphasis on the primary research literature. Students will complete a sequence of writing assignments in response to posted prompts, present current research about a topic of personal interest, and actively contribute to class conversations during and between seminar meetings using a variety of forms of participation. We will convene for three hours of course meetings per week.

LEARNING OUTCOMES

After this seminar you will be able to...

- Define the evolutionary mechanisms underlying genetic conflicts including host-pathogen evolution and meiotic drive
- Evaluate both individual patient and population-level approaches to the treatment of human disease
- Write concise narrative prose applying evolutionary principles to a broad array of human diseases
- Envision the frontiers and immediate future of evolutionary medicine, a fast-moving field at the interface of evolutionary biology and immunology

COMMITMENT TO BUILDING AND NURTURING AN INCLUSIVE CLASSROOM

In my role as seminar facilitator, I will strive to build and nurture an inclusive, responsive classroom that supports you as a student and human being. I value the diversity of backgrounds and experiences that together we bring into our space and I will try my best to provide an equitable learning environment that supports all seminar students.

I recognize that the practice of scientific research, both in the past and today, is not unbiased, but rather a reflection of the flawed society in which it occurs. I also acknowledge that harm continues to be done to people who hold historically excluded identities, including but not limited to first-generation, low-income (FGLI), LGBTQ+, neurodiverse, and BIPOC individuals.

I know that students face significant personal, familial, and societal stressors that place considerable demands on your time and energy, both inside and outside our classroom. I ask that if you encounter difficulties in this course, you reach out to me, your dean (or both) as soon as you are able so we can craft a path forward that works for you.

I welcome your feedback and commit to listening to/reading your concerns in full, believing that your experiences in this course are real, and responding to your concerns by implementing necessary changes to the best of my ability.

READINGS

All readings will be available on Moodle.

Accessibility of required texts: All readings will be made available free of charge as high resolution scans tagged using Moodle's built in accessibility features.

CRITQUED AND EVALUATED WORK

Course assignments and corresponding weights indicated below. Course graded out of 300 points. Weight and number of assignments subject to change if necessary.

ASSIGNMENTS – Course graded out of 300 total points

Response Papers – 3 response papers, 50 points each

You will complete five short response papers this semester (~6 pages double-spaced maximum length) in response to a posted prompt.

Writing focus will depend on the content of course. You will have ~2-3 weeks to complete each response paper, enabling you to bring themes from different class sources and conversations into your writing. I will provide feedback and a grade each written response using feedback features on Moodle using the following categories: 1) Content (~25%), 2) Analysis/Creativity (~50%), 3) Writing (~25%)

Response Paper Grading Rubric

45-50 points: Outstanding work that draws on multiple sources to support an argument. Clear, concise prose that is easy for an instructor to follow. A 50/50 on a response paper is rare in this course.

40-45 points: Strong work that connects to course material and addresses the prompt in a complete manner. Argument or prose challenging for Dr. Williamson to follow.

35-40 points: Complete work related to prompt. One or more aspects of the prompt unaddressed.

34 points and below: Brief response that does not present a cohesive argument or multiple aspects of the prompt unaddressed.

Facilitated discussion about an Evolution & Medicine topic of personal interest – 75 points

Each student will lead the class in conversation about a topic of personal interest. These student-facilitated class meetings will occur near the end of the semester. We will establish a set of norms for these discussion prior to the first student-led class.

Final Portfolio – 50 points

During our mid-semester conversation we will discuss what a meaningful final piece of work would look like to you in the context of this course. Students will have the opportunity to choose from a menu of options we'll develop as a class. Possible examples of a final portfolio include: a collection of your response papers with a 4-6 page written introduction about your path in this course and meaningful learnings along your journey, a recorded audio podcast about a current topic in Evolution & Medicine, or an online or hard copy poster about a topic you found interesting during the class.

Contributions to the Seminar

Contributions to the seminar will take a variety of forms including but not limited to attendance and speaking in class.

Points for Key Pieces of Evaluated Work (300 pts total for class)

3 written responses (50 pts each).....	150 points
Facilitated discussion about a topic of personal interest.....	75 points
Final Portfolio.....	50 points
Contributions to seminar (participation).....	25 points

ATTENDANCE

Our seminar is focused on supporting you and your learning. It is my sincere hope that our space is a valuable opportunity to move your work forward each week and provide a space for our community reflect on one another's progress towards our goals. Thus, it is my expectation that each student will attend every seminar meeting. That said, I am fully cognizant that each student is working in the context of variety of stressors. **Please contact me directly via email or through your dean if you anticipate missing a scheduled seminar meeting.**

COURSE POLICY REGARDING GENERATIVE AI

The central goal of this seminar is to give you an opportunity to develop your skills navigating and critically evaluating primary sources in the fields of science and medicine and distilling these complex concepts into clear and effective communication. One form of communication is written, but academic writing is not just about submitting a final piece of work; rather, it is a *process* that allows you to take what at first appears confusing and transform it into something that makes sense to you. Thus, writing is essential for learning. Emerging generative AI tools have potential to simultaneously support and undermine this process.

Short papers and seminar presentations: Original written work attributed to one or more identified human authors that properly cites prior scientific literature is the primary form of scholarship in the field of evolution and medicine. Over the course of the term, you will complete three short papers focused on different seminar topics and lead a discussion in class about a topic of your choice chosen from a menu of options. You are welcome, but not required, to use sources beyond those assigned in class for paper research. The student-led discussion will require you to identify and find sources to assign as class readings related to a topic chosen from a menu of options. As students enrolled in a seminar course focused on immersing you in scholarship in

this field, you will be responsible for anything you turn in under your own name. This includes inaccurate, biased, offensive, or otherwise unethical content.

You **may** use AI programs to help generate ideas, find topics that interest you, or identify relevant research materials *in the context of discovery*. You should, however, understand the material generated by these programs may be inaccurate, incomplete, or otherwise problematic.

You **may not submit any prose or presentation slides generated by an AI program as your own**. Because writing is learning, and the ability to integrate and communicate in writing is a central learning goal of this class, I ask that you do your own work on the short papers and putting together slideshow presentations for your student-led discussion and work designing your novel immunotherapy.

Please note that at the end of your short papers and slide show presentations I will ask you to disclose if any AI tool was used and, if so, to describe which tool you used and how you used it.

DUE DATES AND EXTENSIONS

Due Dates: I set the schedule so you are only working on one key piece of evaluated work at a time for this course. Please submit your work on Moodle by the deadline to protect your time and allow me to provide actionable feedback in a timely manner. **Please review the key due dates and let me know by Jan 29th if you have potential conflicts.**

Extensions: I will discuss extensions on a case-by-case basis as necessary. Please note the lowest reflective writing assignment is dropped when calculating your final grade.

GRADES AND PROVISIONAL GRADING SCALE

Grades on Moodle: Any overall course grade visible on Moodle is not a reflection of your current grade for the course. I understand this is confusing for students. So why is it this way? The Moodle gradebook requires the instructor to enter percentages for each assignment prior to the term and is somewhat inflexible if changes are required during the semester. It is important to me that there be some flexibility on assignments if circumstances necessitate a change to coursework or percentage of the final course grade for each piece of work.

Grades for this course will likely be assigned as follows:

The grading scale for this course is subject to change. However, please note any change will be in the students' favor (i.e. the 3.3 cutoff would not be higher than 87% but may go lower if necessary)

93 - 100% = 4.0
90 - 92% = 3.7
87 - 89% = 3.3
83 - 86% = 3.0
80 - 82% = 2.7
77 - 79% = 2.3

70 - 76% = 2.0

OFFICE HOURS

Office hours with your instructors offer you an opportunity to discuss aspects of course material you find interesting and/or challenging, develop your academic professional network, and represent an important piece of academic science's "hidden curriculum." I encourage you to attend as helpful for your studies and/or introduce yourself and let me know about your intellectual interests and future professional plans.

Accommodations (*italicized text from BMC Access Services*)

Students needing academic accommodations for a disability must first register with Access Services. Students can call 610-526-7516 to make an appointment with the Director of Access Services, Deb Alder, or email her at dalder@brynmawr.edu to begin this confidential process. Once registered, students should schedule an appointment with the professor as early in the semester as possible to share the verification form and make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement. More information can be obtained at the Access Services website. (<http://www.brynmawr.edu/access-services/>)

Recording class (*italicized text courtesy of BMC Access Services*)

Any student who has a disability-related need to record this class first must speak with the Director of Access Services and to me, the instructor. Class members need to be aware that full class meetings may be recorded.

Title IX concerns (*italicized text from Bryn Mawr College Provost*): Bryn Mawr/Haverford College is committed to fostering a safe and inclusive living and learning environment where all can feel secure and free from harassment. All forms of sexual misconduct, including sexual assault, sexual harassment, stalking, domestic violence, and dating violence are violations of Bryn Mawr/Haverford's policies, whether they occur on or off campus. Bryn Mawr/Haverford faculty are committed to helping to create a safe learning environment for all students and for the College community as a whole. If you have experienced any form of gender or sex-based discrimination, harassment, or violence, know that help and support are available. Staff members are trained to support students in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more.

The College strongly encourages all students to report any incidents of sexual misconduct. Please be aware that all Bryn Mawr/Haverford employees (other than those designated as confidential resources such as counselors, clergy, and healthcare providers) are required to report information about such discrimination and harassment to the [Bi-College Title IX Coordinator](#).

BIOL B317 Evolution & Medicine: Seminar Schedule and Readings
(Subject to Change)

Topic	Dates	Reading(s)	Assignment (due 11:59 pm)
Week 1: Evolutionary thinking	1/22, 1/24	<u>For breadth before W:</u> Benton et al. (2021)	--
Week 2: Evolution of Immunity – RAG1/2	1/29, 1/31	Kapitonov and Koonin (2015) and Fugmann et al (2006)	--
Week 3: Evolution of Immunity - Immunoreceptors	2/5, 2/7	Pancer et al. (2004)	Paper 1 (F 3/1)
Week 4: Evolution of Antibiotic Resistance	2/12, 2/14	Ventola et al. (2015) and Miethke et al. (2021)	--
Week 5: Cross-species transmission and climate change	2/19, 2/21	Carlson et al. (2022)	--
Week 6: Lifespan and aging part I: genetic control of lifespan	2/26, 2/28	Kenyon (2011) and Kenyon et al. (1993)	--
Week 7: Lifespan and aging part II: mutation-accumulation hypothesis	3/4, 3/6	Cui et al. (2015)	Paper 2 (F 4/5)
<i>Take a break!</i>	<i>Spring Break! (3/9 – 3/17)</i>		
Week 8: Placental invasion and preeclampsia	3/18, 3/20	Crosley et al. (2013)	--

Week 9: Somatic evolution and cancer	3/25, 3/27	Nowell, P.C. (1976)	--
Week 10: Horizontal gene transfer	4/1, 4/3	Chou et al. (2015)	Paper 3 (Th 5/2)
Week 11: Evolution and neurodegenerative diseases	4/8, 4/10	Cookson (2012) Nitsche et al. (2021)	<i>Discussion slides due 24h before your presentation on Moodle</i>
<i>Weeks 12 and 13: Student presentations and facilitated discussions:</i> Mismatch, evolution-inspired therapies and other topics of student interest.	M 4/15	--	Facilitated discussion
	W 4/17	--	Facilitated discussion
	M 4/22	--	Facilitated discussion
	W4/24	--	Facilitated discussion
Week 14: Evolutionary medicine in the age of genome editing	4/29, 5/1	Wang and Doudna (2023)	Final portfolio (Due end of finals)