

BIOL B352: IMMUNOLOGY with LAB**BRYN MAWR COLLEGE**

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Lecture/Discussion: T/Th 8:25-9:45a, Park 245
Lab: Th 1:10p-4p, Park 126
Office Hours (Park 212): Mon 1:10pm – 2:00 pm;
Th. 9:45 am – 10:30 am

OVERVIEW

Welcome to immunology with lab! I'm thrilled to be working with you this term. This semester we'll explore the field of immunology, with a focus on the dynamic network of molecules and cells underlying the vertebrate immune response. This problem-based workshop course uses primary research articles and a curiosity-driven, open-ended laboratory research project to make sense of complicated biology and empower each student to build a big-picture view of this fast-moving, interdisciplinary field. Key themes include: immune cell specification and development; molecular recognition and immune cell signaling; generation of immunological memory; and cancer immunotherapies. Learning strategies include problem solving, small group discussion, and facilitated analysis of the primary literature.

COURSE COMPONENTS

1. Lecture/Discussion: Tues. and Thurs., 8:25 am – 9:45 am, Park Science 245. Class meetings will generally include short lectures and a mix of individual and small group work.

2. Facilitated paper discussions (3) covering key immunology research articles. Paper discussions will occur on specified Thurs. throughout the term organized around the C.R.E.A.T.E. framework (Hoskins et al. doi: [10.1187/cbe.11-03-0027](https://doi.org/10.1187/cbe.11-03-0027))

3. Laboratory – Open-ended exploration of ancient immune cell biology: Thurs., 1:10 pm – 4 pm, Park Science 126

LEARNING GOALS *After this course you will be able to...*

- Formulate a broad understanding of how the molecules and cells that make up the immune system interact to protect organisms and promote homeostasis.
- Learn how to read and discuss primary scientific literature and write thoughtful, substantive responses to immunology research articles.
- Make sense of the complexity of the immune response by developing a rigorous conceptual understanding of immunology.

COMMITMENT TO BUILDING AND NURTURING AN INCLUSIVE CLASSROOM

In my role as course 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 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. In addition to regular student office hours, I offer the following avenues for you to reach out with any questions or concerns:

- 1) An initial conversation early in the semester to develop shared class norms that promote your full participation in our course
- 2) A mid-semester evaluation to implement any necessary changes during the term

KEY THEMES

- Immune cell biology and cell-cell interactions
- Generation of molecular diversity and immunological memory
- Dynamics of the immune response in space and time
- Immunotherapies rooted in fundamental immunology
- Impact of structural racism on scientific research
- Contributions by women and other people underrepresented in immunology

CRITIQUED AND EVALUATED WORK

1. Response Papers (3 assignments throughout the term)

Format: 3-4 page written response to a prompt related to specified research articles you'll read during the term.

Purpose: Enable opportunities reflect on the research article in a meaningful way and demonstrate both technical and conceptual understanding of the work. These response papers are the core assessment mechanism for the course and are designed to couple assessment to a key learning goal: how to read primary research literature.

Logistics: You will have ~two weeks to complete each response paper. Due on Moodle on the indicated day at 11:59 pm EST. Please submit your work as a PDF to enable the instructor to provide feedback effectively.

Grading: Each response graded out of 25 pts. Rubric under "Grades and Grading scale" below. Instructor will indicate grade out of 25 pts in Moodle and provide written feedback. Students can submit revised response papers to recover up to half of unearned points. Revisions must be discussed in advance with Dr. Williamson (usually during a brief meeting in office hours).

2. Checkpoints (short Moodle quiz, ~one per week starting week 2, see syllabus)

Format: Short Moodle quiz or open response most weeks (starting week 2).

Purpose: Provide opportunities to engage with course material each week.

Logistics: Due on Moodle each Wednesday, 5 pm EST. Checkpoints will be posted after class on Tuesdays under the appropriate Moodle header.

3. Final Questions about Current Research Article

Format: Short response questions related to a current research article designed to take ~3 hours to complete.

Purpose: Provide an opportunity for student to meaningfully engage with a new immunology research article and a chance to communicate their understanding of cutting-edge science.

Logistics: Due on Moodle as a PDF at the end of finals (5/11 5 pm EST for seniors, 5/17 noon EST for juniors)

4. Lab Assignments

Format: Written assignment and class presentation related to immunology research project.

Purpose: Opportunity for meaningful engagement with the curiosity-driven lab project and the practice of science.

Logistics: Due on Moodle under the “Immunology Research Lab” header as indicated.

5. Reflections

Format: Short reflective writing assignments graded on completion (i.e. all work submitted on time will receive full credit).

Purpose: Reflect on your own writing practice and self-confidence about written work at the beginning and end of the semester.

Logistics: Due on Moodle as indicated on the syllabus.

GRADES, ASSIGNMENTS, AND PROVISIONAL GRADING SCALE

Grades on Moodle: The 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. Because we are working under uncertain circumstances this term it is important to me that there be some flexibility on assignments.

Course assignments:

Course assignments and corresponding weights indicated below. Course graded out of 200 points. Point values and number of assignments subject to change if necessary.

3 Response Papers, rubric below	75 pts (25 pts each)
10 Checkpoints	50 pts (5 pts each)
2 Reflections	10 pts (5 pts each)
Final questions about current research article	25 pts
Lab Assignment 1 (experimental design)	20 pts
Lab Assignment 2 (lab meeting presentation)	20 pts

Rubric for response papers: Short written responses to a weekly prompt (five-page double spaced maximum) as indicated on the syllabus by 11:59pm EST pm EST. Graded as indicated below (25 points/response)

23 to 25 pts – Exceptional work. Instructor indicates that student demonstrates outstanding technical and conceptual understanding of the article and the ability to communicate a thoughtful response.

20 to 22 pts – Strong work. Instructor indicates that the student demonstrates a strong technical and conceptual understanding of the article.

17 to 19 pts - Complete work. Instructor is able to follow student's logic and prose. Student responds to prompt in a complete manner.

16 pts and below - Areas for growth. Instructor indicates significant areas of growth for the response.

Checkpoints: Short quizzes or open-ended responses on Moodle due each Friday at 11:59pm pm EST (graded out of 5 pts, lowest grade dropped)

Final questions about current research article: Our self-scheduled final "exam" will take the form of written answers to questions about a current research article. The questions are designed to take the student a maximum of 3 hours to complete, in accordance with BMC's finals policy. The questions and article will be posted on Moodle on Monday May 2nd and due at the end of the finals period (note that seniors and juniors have different end dates). The final questions are open book/open note – please think of this assignment as a guided response paper. It is not a test of memorization etc.

Lab assignments. Two total lab assignments totaling 40 pts. The first assignment is an opportunity for you to reflect on the rationale for our project. The second lab assignment is a lab meeting-style presentation to the class about your group-designed project.

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

RESOURCES

Student 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."

Office hours are schedule after class on Thursdays (ending at 10:30 am) and Monday afternoons 1:10 p -2 p. If these times don't work for you please email three times that work to meet, we'll figure out a time to connect.

Required Textbook

The text for this course is Kuby Immunology 8th edition (2019). Dr. Jenni Punt, Dr. Sharon Stranford, Dr. Patricia Jones, and Dr. Judy Owen, the four authors who made this scholarly contribution to our field, extensively reworked the book and added chapters that address our key themes. The text also includes an excellent glossary.

CLASS NORMS

I am committed to help build an inclusive immunology learning and research environment that supports students with different prior experiences and learning styles. Class Norms resulting from our community efforts to implement TLI's guidelines towards "Making Our Classrooms Places of Inclusion and Belonging" (please see Cook-Sather, A., & Des-Ogugua, C. (2018). DOI: [10.1080/13603116.2018.1441912](https://doi.org/10.1080/13603116.2018.1441912)) will be established early in the second week of the semester as a group. All members of our learning-research community will have the opportunity to help shape our Class Norms.

ATTENDANCE

I expect that you will attend all Tues-Thurs lecture/discussion meetings and Thursday labs. Please look at the course schedule and let me know by Jan. 30th if you anticipate missing one or more class meetings. That said, I am fully cognizant that we are all working in the context of various stressors and that illness or other challenges will necessitate missing class. **I ask that you keep in contact directly with me or through your dean if you anticipate missing more than one class meeting in succession.**

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 immunology. Over the course of the term, you will complete three short papers (dates below) 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 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.

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.

DEADLINES

Please submit your work on Moodle by the deadline to protect your time and allow me to provide actionable feedback in a timely manner. I will discuss extensions on a case-by-case basis.

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.

BIOL B352 Immunology: Lecture-Discussion Schedule and Readings (Subject to Change)

Theme	Date	Recorded Lecture	Class Format	Reading	Assignment (due by 11:59 pm EST)
Week 1: Evolution of immunity & clonal expansion	T 1/23	-	Lecture/Discussion	None	---
	Th 1/25	-	Lecture/Discussion	Kuby Ch. 1 start through Table 1-4	Reflection 1 (Sun 1/28)
Week 2: Hematopoiesis & Immune Cell Specification	T 1/30		Lecture/Discussion	Kuby Ch. 2 start through Table 2-1	--
	Th 2/1	On-ramp to paper 1	Paper Discussion	Spangrude et al. (1988)	Checkpoint 1 (Sun 2/4)
Week 3: Recognition and response	T 2/6	-	Lecture/Discussion	Skim Kuby Ch. 2 start through Fig. 2-15 Read Kuby Ch. 3 start through Fig. 3-9	--
	Th 2/8	-	Lecture/Discussion	Kuby Ch. 3 Fig. 3-15 through Fig. 3-17	Checkpoint 2 (Sun 2/11)
Week 4: Innate Immunity-Toll-like receptors	T 2/13	-	Lecture/Discussion	Kuby Ch. 4 start through Fig. 4-9	--
	Th 2/15	On-ramp to paper 2	Lecture/Discussion	Janeway (1989)	--
Week 5: The Variable Lymphocyte Receptors	T 2/20	-	Lecture/Discussion	Kuby Ch. 6 start through Fig. 6-9	--
	Th 2/22	-	Lecture/Discussion	No new reading (catch up or review)	Response Paper 1 (Fri 2/23) Checkpoint 3 (Sun 2/25)
Week 6: Antigen presentation	T 2/27	-	Lecture/Discussion	Kuby Ch. 7 start through Fig. 7-7	--
	Th 2/29	-	Lecture/Discussion	Kuby Ch. 7 Fig. 7-12 through Fig. 7-18	Checkpoint 4 (Sun 3/3)
Week 7: T-Cell Development	T 3/5	-	Lecture/Discussion	Kuby Ch. 8 start through Fig. 8-10	--
	Th 3/7	-	Overview – Immune cell diversity and specification	No new reading (catch up or review)	---
Spring Break!	Take a break! No class on T 3/12 or Th 3/14				

Week 8: T-Cell Activation and Inhibitory Signaling	T 3/19	-	Lecture/ Discussion	Kuby Ch. 10 start through Fig. 10-7	--
	Th 3/21	On-ramp to paper 2	Paper Discussion	Hui et al. 2017	Checkpoint 5 (Sun 3/24)
Week 9: B-Cell Development	T 3/26	-	Lecture/ Discussion	Kuby Ch. 9 start through Fig. 9-4	--
	Th 3/28	-	Lecture/ Discussion	Kuby Ch. 9 Box 9-2 through Fig. 9-10; "Comparison of B- and T-Cell Development"	Checkpoint 6 (Sun 3/31)
Week 10: B-Cell Memory and Vaccines	T 4/2	-	Lecture/ Discussion	Kuby Ch. 11 start through Fig. 11-10	--
	Th 4/4	Dr. Katalin Karinkó's 2023 Nobel Prize Lecture	Lecture/ Discussion	No additional reading (catch up or review)	Checkpoint 7 (Sun 4/7)
Week 11: Effector responses	T 4/9	-	Lecture/ Discussion	Kuby Ch. 12 start through Fig. 12-7	Response Paper 2 (Fri 4/12)
	Th 4/11	-	Lecture/ Discussion	Kuby Ch. 12 Fig. 12-14 through end	Checkpoint 8 (Sun 4/14)
Week 12: Complement & Neuro-immune interactions	T 4/16	-	Lecture/ Discussion	Kuby Ch. 5 start through Fig. 5-8	--
	Th 4/18	On-ramp to paper 3	Paper Discussion	Stevens et al. 2007	Checkpoint 9 (Sun 4/21)
Week 13: Cancer Immunology & Immunotherapy	T 4/23	-	Lecture/ Discussion	Kuby Ch. 19 start through Fig. 19-7 <u>Skim</u> Mellman and Chen (2023)	--
	Th 4/25	-	Lecture/ Discussion	Kuby Fig. 19-8 through Box 19-2	Checkpoint 10 (Sun 4/28)
Week 14: The Dynamic Immune Response	T 4/30	-	Lecture/ Discussion	<u>Skim</u> Kuby Ch. 14 for breadth	--
	Th 5/2	-	Overview – Immune Archetypes	Mujal and Krummel (2019)	Response Paper 3 (Thurs 5/2) Reflection 2 (Fri 5/3)

BIOL B352 Immunology Fall 2024: Laboratory Schedule
(Subject to Change)

Date	Laboratory	Reading or Assignment
Th 2/1	Project overview & DNA plasmid preps	--
Th 2/8	Cell culture and transfection	Set up your lab notebook before lab on 2/8 Read Williamson and Vale (2018) before lab on 2/8
Th 2/15	Confocal microscope training & image analysis workshop	iBiology recorded lecture
Th 2/22	Confocal imaging! (Transfect cells Monday 2/19)	--
Th 2/29	Confocal image analysis and preparation of cells for immunofluorescence	Read Lee & Kitaoka (2018) before lab on 2/29
Th 3/7	Confocal imaging! Immunofluorescence samples	--
Th 3/14	NO LAB - SPRING BREAK	---
3/21	Immune cell activation and proximity labeling	--
Th 3/28	Enriching for biotinylated proteins using streptavidin resin	--
Th 4/4	Immunoprecipitation of receptor-bound protein complexes	--
Th 4/11	Imaging the immune synapse using confocal microscopy	--
Th 4/18	Data analysis and work period	Written summary of your "next experiment" inspired by the lab project. You are welcome to work as a group. Submission graded individually.
Th 4/25	Lab Group Presentations	Lightning talks of "next experiment" and research reflection (both graded as individual submissions, not group work)
Th 5/2	NO LAB	--