

BIOL 498/698 – SP: “Glia, the neuron’s forgotten siblings”

COURSE SCHEDULE:	M, R: 2:30 -3:50 PM
ROOM:	KUPF 209
INSTRUCTOR:	Prof. Jorge Golowasch (golowasch@njit.edu)
OFFICE HOURS:	M, R 4 pm or by appointment
COURSE WEBSITE:	NJIT Canvas (https://canvas.njit.edu/)
TEXTBOOK:	None

COURSE SUMMARY

Glia make up about half of your nervous system’s volume. There are several different classes of glia and they all do different and essential things, which have only began to be studied and (partially) understood in the last 20-30 years. This is a delay of more than a century compared to neurons. Moreover, even after we have already discovered many important functions of glia, textbooks and most neuro courses barely address them. *We will fix that!*

Recommended Books

“Glial Man, A revolution in Neuroscience” by Yves Agid & Pierre Magistretti (2021), Oxford University Press, ISBN 978-0-19-884767-0. It’s a light account of some basic history of glia research and glia properties.

“Glia Neurobiology. A Textbook” Alexei Verkhratsky & Arthur Butt (2007). John Wiley & Sons, Ltd. ISBN 978-0-470-01564-3.

LEARNING GOALS

At the conclusion of this course students will have...

- Developed or improved creative and critical thinking, discussion and debating skills (see note on AI at the end).
- Integrated prior knowledge, and developed new knowledge, of glial function and its relationship with the well-known function of neurons in the nervous system.
- An understanding and ability to utilize concepts in cellular neuroscience, specifically related to the role of glia in the function of the nervous system.
- Developed or improved literature searching skills.
- Developed or improved scientific writing skills.
- Developed or improved the ability to understand, synthesize and present primary scientific literature and ideas.

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COURSE OUTLINE (This outline may change due to course pacing)

Week 1 (1/23): Introduction: the mechanics of this course. How to perform literature searches. Discussion on writing, presentation, critical evaluation of materials.

A historical view of why glia are (still) *the neurons' (almost) forgotten siblings*.

Review of basic neuro concepts: action potentials, saltatory conduction, synaptic potentials, ion channels, primary and secondary transporters, intracellular calcium.

Assignment of first papers.

Week 2 (1/27, 30): Refresher continued: old and new technologies that have enabled the study of glia biology.

Types of glia/morphology/localization/numbers, glia across the animal kingdom.

Week 3 (2/3, 2/6): Glia wrapping (Oligodendrocytes, Schwann cell, Remak Schwann cells).

Week 4 (2/10, 2/14): Glia in the peripheral NS – Schwann Cell biology & function; glia in the ENS.

Week 5 (2/17, 2/20): Gliotransmission, Ca signaling and dynamics. 2/20: IN CLASS WRITING.

Week 6 (2/24, 2/27): Glia and extracellular milieu homeostasis.

Week 7 (3/3, 3/6): Glia and neuronal nourishment, metabolic coupling.

Week 8 (3/10, 3/13): Astrocytes and learning/synaptic plasticity/critical period. 3/13: IN CLASS WRITING.

Week 9 (3/24, 3/27): Glia and rhythmic activity.

Week 10 (3/31 – [4/3: Wellness Day - No class]): Blood brain barrier, glymphatic system, sleep. No presentations this week.

Week 11 (4/7, 4/10): Glia and pathfinding, evolution of glia: 4/10: IN CLASS WRITING.

Week 12 (4/14, 4/17): Tuning neuronal signals by microglia.

Week 13 (4/21, 4/24): Microglia and anesthesia.

Week 14 (4/28, 5/1): Astrocytes and injury.

Week 15 (5/5, 5/6): TBA. 5/6: IN CLASS WRITING.

Weekly readings:

- One (sometimes 2) paper(s) on the topic of the following week will be assigned to the class on the second day of a given week (Thursdays). These papers will typically be review papers and should be read by all to provide guidance and context. We will discuss this/these paper/s on Mondays as a group.

Presentations:

- 2 designated students will then search from the literature 1 paper each related to the topic. You will send the paper(s) you selected to me at the latest on Tuesday of that week for me to confirm that it is appropriate. **You will present the paper you choose to the class and lead a discussion on Thursday of that week.** You will be leading the discussion! 30 min each max.
- A short quiz will follow on the 2 papers (on Thursday). See below: Quizzes.

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Quizzes (Thursdays of each week)

- In class, short quizzes on the two papers presented by students on the same day via Canvas.

Final paper:

- By February 15th each student will choose a topic from the syllabus' weekly topics to write your final paper. The paper will be developed by a combination of in class and homework assignments.
- The expectations will be discussed in class. There will be different criteria (and grading rubrics) for graduate and undergraduate students.
- ~5 pages or 2000 words (max), not including references or figure legends.
- There is no minimum for references or figures, but each statement in the paper must be backed by an appropriate reference. As a rule of thumb, a 2000 word scientific paper is typically backed by 12 or more references.
- One figure minimum will be required that illustrates the main elements of the mechanisms involved are expected. The figure has to be created by you even if you draw it by hand. Must be clear and have a clear legend describing it.
- In class writing will all be done through Canvas with the browser locked down. So, please install Respondus here:

<https://download.respondus.com/lockdown/download-finished.php?id=264548414>

Canvas is the official site for course materials. Thus, assigned papers and grades will be posted on our Canvas page, and all essay submissions will be through Canvas. Make sure you have access to it.

All communication will be through Canvas and the [@njit.edu](mailto:*@njit.edu) email you were given when you signed up for an NJIT course. Students enrolled in NJIT classes are automatically-assigned an NJIT email address. Canvas messages go ONLY to that address. You can change the email once you login to NJIT Canvas. Please take the following steps to ensure you get the course materials:*

New Users:

<https://profile.myucid.njit.edu/identity/self-service/njit/acctclaim.jsf?type=Default>

Took a class at NJIT before:

<https://profile.myucid.njit.edu/identity/self-service/njit/login.jsf>

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GRADING POLICY AND SCALE

Assignment	%
Weekly participation	20
Weekly quizzes	25
Presentations	25
Final paper	30
TOTAL	100

Grading Scale		
	UGs	GRs
A	90.1 - 100	90.1 – 100
B+	84.1 - 90	84.1 – 90
B	76.1 - 84	76.1 – 84
C+	69.1 - 76	69.1 - 76
C	62.1 - 69	62.1 - 69
D	55.1 - 62	NA
F	0 - 55.	0-62

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IMPORTANT RULES AND POLICIES

- ❖ If you miss a class due to a valid excuse, medical or other, let me know ahead of time for your in-class participation grade not to be affected. Otherwise, submit your documentation to the Dean of Students. Same applies to missed quizzes (they will not count towards your quiz average if you tell me before the quiz). In general, we will follow the Biology department's policy on absences: <https://biology.njit.edu/policy-absences>
- ❖ The use of cell phones and other two-way electronic devices during exam times is prohibited. Laptop computers and tablets are recommended in class to share the papers others are reading and presenting. No phones in class!
- ❖ **Academic Integrity** is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the [academic code of integrity policy](#). Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. And I will report that!!

Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of XF, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the [Dean of Students Office](#).

- ❖ **Artificial Intelligence (AI) tools**. We are all still learning how to use these tools appropriately. In academic activities, AI use is complicated, especially when it comes to its use during teaching assignments. It is my conviction that the use of AI to answer homework, quizzes and exams is not only dishonest, but it damages your learning experience. One of [the most prized skills that most employers value](#) is critical and creative thinking. One of the most important skills we will apply and develop in this class are precisely those: creative and critical thinking. When one uses AI to get ideas, those skills are automatically compromised. We will have a deep discussion on this issue the first day of class, including what is and what is not an acceptable use of AI in this class.

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- Course Repetition Policy: An NJIT student may take a single course no more than four times (counting NJIT and other institutions), including withdrawals. If an undergraduate course is repeated at NJIT or the course is transferred from another institution, only then the lowest of the grades is excluded in computation of the cumulative GPA. All grades are shown on the student's transcript.
 - Final exam conflict resolution rules: <http://www.njit.edu/registrar/exams/conflict.php>

NJIT SUPPORT RESOURCES

Emergency Support

Crises Happen: If you experience a life emergency and are unsure which support services to turn to, NJIT Public Safety can connect you to emergency support systems - call 973.596.3111. For medical, psychological or psychiatric emergencies you can also call: University Hospital Crisis, 973.623.2323.

If you want to report a concern about another students' well-being you can also reach out to the **NJIT CARE Team** (<https://www.njit.edu/care/>) or the Dean of Students Office (973.596.3466).

Mental Health and Stress Management

Center for Counseling and Psychological Services (**C-CAPS**) is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available: <https://www.njit.edu/counseling/gethelp>

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Special Accommodations

If you have a disability or a personal circumstance that will affect your learning in this course, please let your instructor know as soon as possible so that we can discuss the best ways to meet your needs. Any student who needs accommodation for disabilities should also contact the **Office of Accessibility Resources and**

Services (OARS): <https://www.njit.edu/studentssuccess/accessibility>
