SPRING 2020: CELL BIOLOGY OF MYELINATION

Course numbers:
Hunter undergraduate: BIOL 471.97
Hunter Graduate (M.A): BIOL 790.85
CUNY Graduate Center (Ph.D): BIOL 793.05

Instructor: Dr. Carmen Melendez-Vasquez
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Course hours: Wednesday 3:00 PM – 5:30 PM
Location: Room 926 HN

Course Description:
In this course, we will be use original research articles and reviews to study specialized aspects of myelin biology, including: glial cell development, transcriptional control of myelin genes, protein synthesis and transport, myelin assembly and maintenance and myelin pathologies. **Students are expected to read at least one primary literature paper and one review for class and to actively participate in class discussions.**

Learning Objectives:
Students will acquire specialized knowledge on various aspects of cell biology of myelination.
Students will develop skills to critically evaluate primary literature papers and research presentations.
Students will develop skills to produce and present a research seminar.

Textbook
There is no textbook for this course. We will use primary research papers and scientific reviews. All reading materials will be posted on Blackboard. In the event of Blackboard system malfunction, information on how to access an alternate site will be provided by an e-mail sent to the address registered in your Blackboard account.

Policies:
INCOMPLETES: A grade of **IN** can only be given if two conditions apply: (1) You are unable to complete the course due to an unforeseen emergency **AND** (2) You are **passing** the course at the time you become unable to continue. **Please do not ask for an incomplete if any other circumstances apply.**

The OFFICIAL WITHDRAWAL date this semester is **Monday, April 1st**.

GRADING: This is a combined course: graduate students are expected to provide more sophisticated questions, answers and presentations than undergraduates. Undergraduates who register for the graduate level course will be treated as graduate students. The final score for the course will be calculated as follows:

1. Class participation (15%): Students are required to attend class, be prepared and take an active role in class discussion. Participation is graded based on the quality of a student's questions and answers during each presentation as well as by his/her overall involvement in the discussion.

2. Article critiques (15%): Each week, prior to class, students must complete a short **1-page** report about the original research article being discussed. The report consists of **5 brief paragraphs** answering the following questions about the paper to be presented:

1. **Why is it important to study this specific gene/molecule/process/disease?**
2. **What is the hypothesis to be tested in the article?**
3. **What was the main take-home message/conclusion(s) of the article?**
4. **Does the data in the article support the conclusion(s) of the authors? Give 3 examples**
5. **What should be the next hypothesis to be tested?**

Article critiques should be e-mailed to the instructor no later than noon on class day. No excuses.

3. Paper Selection (15%): Each student is expected to present one research article at the end of the semester. Articles can be selected from any of the reviews/topics provided by the instructor, although students can propose other articles for approval.

All students must have a paper selected for presentation no later than Wednesday March 4th.

4. First draft of PPT and Summary for Class (15%): Prior to the date of their final presentations students are advised to submit a draft of their summary and PPT for comments and modifications. Do not wait until the last week or day to do this as the final corrected version of the summary has to be made available to the class the Monday prior to the scheduled presentation date.

5. Final Student Presentation (40%): The PowerPoint presentations will be graded based on several criteria such as organization, content, delivery, comprehension, discussion and conclusions. Detailed guidelines, instructions and tips for final presentations and summaries can be found in the course Blackboard page.

ATTENDANCE: Attendance is **mandatory**. Missing more than two classes unexcused will result in a **Fail** (**F**) grade. There are, of course, situations that are reasonable for missing a class, such as medical emergencies, and travel to professional meetings. If you plan to be absent and need to be excused, contact the instructor **before** missing the class. Supporting documentation of a university-sanctioned excuse is required.

COLLEGE NOTICE: Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

Term Schedule of sessions and selected bibliography
PART I

Class 1/29 Introduction to Myelination

Main Paper: Salzer JL & Zalc B. Primer Myelination Current Biology 2016, 26: R937-R980 (*also good for 2/26 class)

Other useful resources:
Network Glia: Classic Papers: http://www.networkglia.eu/en/classicpapers

Rosenbluth J., A brief history of myelinated nerve fibers: one hundred and fifty years of controversy. *J. Neurocytol* 1999, 28: 251-262

Zalc, B., The acquisition of myelin: an evolutionary perspective Brain Research 2016 1641:4-10

Class 2/5 Structural and molecular organization of the myelinated axon

Review: Rasband M., Composition, assembly and maintenance of excitable membrane domains in myelinated axons. *Sem Cell Dev Biol* 2011, 22: 178-184

Class 2/19 Schwann cell development and myelination (Article critique #1*)

Review: Monk et al., New insights on Schwann cell development. Glia 2016, 63:1376-1393 (*also good for 3/18 class)

Article: Parkinson DB et al., c-Jun is a negative regulator of myelination *J Cell Biol*. 2008,181:625-37

*Commentary: Salzer J. Switching myelination on and off. *J Cell Biol* 2008, 181:575-77

Class 2/26 Oligodendrocyte development and myelination (Article critique #2*)

Review: Emery, B. Regulation of Oligodendrocyte Differentiation and Myelination. Science 2010, 330:779-782 (*also good for 3/11 class)

Article: Emery, B. et al., Myelin gene regulatory factor is a critical transcriptional regulator required for CNS myelination *Cell* 2009, 138:172-185.

Class 3/4 To wrap or no to wrap? That's the question: selection of axons for myelination (Article critique #3*)

Review: Taveggia, C., Schwann cells-axon interaction in myelination. *Current Opinion in Neurobiology* 2016, 39:24-29

Article: Taveggia C. et al., Neuregulin-1 type III determines the ensheathment fate of axons. *Neuron*. 2005, 47:681-94

PART II.

Class 3/11 Adaptive myelination and plasticity (Article critique #4*)

Review: Almeida & Lyons On Myelinated Axon Plasticity and Neural Circuit Formation and Function *J Neurosci* 2017 37: 10023-10034

Article: McKensie et al., Motor skill learning requires active central myelination. *Science* 2014 346:318-22

* Perspective: Long P & Corfas G To learn is to myelinate *Science* 2014 346: 298-299

Class 3/18 Extracellular matrix interactions and cytoskeletal regulation of myelin formation (Article critique #5*)

Review: Court et al., Basal lamina: Schwann cells wrap to the rhythm of space-time *Curr Opin Neurobiol* 2006, 16:501-7

Article: von Boxberg et al., Giant scaffolding protein AHNAK1 interacts with β-dystroglycan and controls motility and mechanical properties of Schwann cells. *Glia*. 2014 62:1392-406.

Class 3/25 Myelin and disease I. Inherited neuropathies (Article critique #6*)

Review: Morena et al., Charcot Marie Tooth: From Molecules To Therapy. *Int J Mol Sci* 2019 20: pii: E3419. doi: 10.3390/ijms20143419.

Article: Serfecz et al., Downregulation of the human peripheral myelin protein 22 gene by miR-29a in cellular models of Charcot-Marie-Tooth disease. *Gene Ther* 2019, 26:455-464

Class 4/1 Myelin and disease II. Multiple sclerosis and remyelination in the CNS (Article critique #7*)

Review: Plemel et al., Remyelination therapies: a new direction and challenge in multiple sclerosis. *Nat Rev Drug Discov*. 2017 16:617-634.

Article: Keough., An inhibitor of chondroitin sulfate proteoglycan synthesis promotes central nervous system remyelination. *Nat Commun*. 2016 7:11312.

4/7 First draft of PPT and summary to class due (TUESDAY)

PART III

Students Presentations

4/22 Students presentations: Group 1

4/29 Students presentations: Group 2

5/6 Students presentations: Group 3

5/13 Students presentations: Group 4