

Bio5890/7890 Neuroplasticity

M/W 2:30-3:45 pm
Synchronous on-line

W2021

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Bio7890 students be sure to carefully read the addendum of this syllabus as it explains the changes in your grading scale.

Description: Plasticity is the ability of something to be shaped or molded from its environment. Arguably, the development of the nervous system is plasticity at its best. As an embryo grows and forms, cells respond to their environment and one part of it is formed into an exquisite nervous system, with different pieces in highly defined locations. That is given the segregation of functionality seen in the nervous system, a neuron in the grey mater shares lots of properties with a motor neuron in the spinal cord, but these have been determined by the microenvironment and history of progenitor cells in these different regions. Plasticity continues as axons extend out to targets and form synapses, and even these change in response to learning and memory events, and to considerable rearrangements during adolescent growth, with concomitant changes in body shape and size, as well as emotional states and character development.

To provide a focus point, this course will examine the basic principles underlying development of a functional nervous system. Neural development is a fascinating process that combines fundamental knowledge of cell biology chemistry, genetics and physiology. Seminal work, from a variety of animal models will be discussed as we outline the way underlying principles were uncovered by research. We will examine the principles underlying neural induction, and the establishment of anterior-posterior and dorsal-ventral axes that establish the different functional regions of our nervous system. We also look at neurogenesis, neuronal migration and differentiation, axon pathway formation, and synapse formation (PNS and CNS). The course is rounded out as students select their own special topic in neural plasticity and develop both written and oral presentations on this topic.

Course Structure: The course structure *focuses on self-learning and discussion*, critical skills to your future success as professionals. You cannot be a passive learner in this class. Students are expected to read all assignments before our class meeting and engage in oral discussion of the content during our synchronous class sessions. The prof will guide this process with homework and moderating the discussion, only rarely resorting to a standard lecture. This is important as your final presentation includes both written and oral components and requires a lot of self-learning and motivation. Thus the combination of activities in class is designed to develop your self-learning skills, and your ability to communicate this information as young neuroscientists.

Learning Outcomes

- You will delineate how basic processes of cell biology, genetics and gene regulation governing the development of the nervous system.
- You will describe how selected molecular families provide key information (signaling) during several different developmental stages.
- You will discover how the research process slowly uncovers the cellular and molecular basis of the fundamental processes underlying development.
- You will develop your ability to analyze and interpret research results and appreciate the strengths and weaknesses of different model organism.
- You will improve self-learning through critical thinking and discussion of concepts with classmates.
- You will significantly enhance your written and oral communication skills, as well as organizational skills necessary to compete a self-driven professional project.

Text: Developmental Neurobiology, by Lynne M. Bianchi [© 2018 by Garland Science, Taylor & Francis Group, LLC; ISBN 9780815344827].

This is an undergraduate level textbook covering the fundamental ideas of developmental biology. Based on numerous research papers, it is also well written and complemented by great figures. Importantly, it highlights the process of scientific discovery. Primary research papers will also be assigned

for reading and discussion. PDF s of these papers will be uploaded and moderated using a social media platform called Perusall (see below).

Canvas: Log in at <https://canvas.wayne.edu/> and access this class often. Importantly, use the links provide within Canvas site to directly link to Zoom sessions, and to the Perusall platform. I will be developing the class throughout the semester and will try hard upload things in a timely fashion, but some material may be last minute. Zoom sessions are recorded, although I am not sure how useful those will be. Canvas works best in Chrome, and if you have connection problems contact C&IT help desk.

Communication to prof: To ensure I receive your notes, it is best to e-mail me directly [mvb@wayne.edu] rather than through the Canvas system.

Office hours: Given we are remote, contact me by e-mail to establish a mutually convenient appointment. I will then send you a private Zoom link. If it is science questions be sure to ask them during our synchronous sessions.

Attendance & timeliness: Given the discussion nature of the class, timely attendance is important. Some HW assignments will usually be due either at the beginning of each class or within an hour or two of the class ending. Repeated absence will affect your grade as your HW will be deemed late (even if you submit on time). You are also responsible for all class announcements even if they are not posted on Canvas. If we end up having a final exam (hoping not to do so), the time allotted for that exam will not be extended if you are late.

Grading Policy: The goal is to have all students experience deep learning through an in-depth discussion of developmental neurobiology, without traditional exams. **However, the absence of exams is contingent on effective and strong participation by all students.**

As long as participation remains high and active, NO formal exams will be administered. A decrease in performance includes a lack of preparation, unwillingness to verbally answer questions, decreased attendance, and missed HW deadlines by a number of students. If class participation decreases you will be warned to improve, but a failure to do so will force the professor to introduce a “Final Exam.” If this occurs, the exam will be in the time slot designated by WSU for our final exam [Wed. April 28 from 2:30 to 4:30 pm]. Such an exam will be an open book cumulative exam worth 25% of your grade and reduce the weight of HW accordingly (from 50 to 25%). **Seriously, let’s avoid this as it would ruin the class.**

Instead, let’s enjoy learning something new, but it does require two things from you: 1. Willingness to engage in the weekly work by reading, studying and thinking about the material before class, and 2. Actively answer questions in class by speaking up. Yes, it is scary, but you will soon be a young professional requiring this skill. You will be wrong (maybe even often), but you learn more when you are wrong, and you will improve as you answer more questions. There is no penalty for being wrong and I assure you we will all be wrong sooner or later.

Bio5890		%	pts (500)
Perusall		10	50
HW	RVQs	40	200
	JIT Qs	10	50
presentation	written	30	150
	oral defense	3	15
	oral presentation	7	35
		100	500

Assuming full participation, half of your grade (50%) will be based on weekly homework, while another 40% on your small research project with written and oral parts. The remaining 10% of your grade is based on your work learning to read research papers via our use of an on-line platform called “Perusall.” Additional details of each component are described below.

Keep in mind that with our on-line environment, all assignments need to be typed and submitted via Canvas, often including a plagiarism check. This should at least take care of legibility issues, and improve spelling and grammar issues, too.

Homework: Weekly homework (HW) represents the primary means I am using to make sure you are learning by fully engaging in the reading and preparation needed for each class. As a whole it makes up

50% of your final grade. *It is very important to take the homework seriously! It is not “busy work,” but it will keep you busy each week!*

The HW section has two components. The major part is typical HW questions that you submit as announced, usually the next class or after a weekend to complete. These will focus on specific textbook chapters and/or aspects of the research papers we will read. This is the primary means I have to assess how well you understood each section. The type of question and numbers will vary but require written answers. Each will be assigned points based on the kind of answer being sought. You will accumulate these points all semester and as an aggregate they will be worth 40% of your final grade. You will be allowed one late submission without penalty, a second late submission will have a 25% reduction in possible points, and any other late submission will incur a 50% reduction in possible points. A doctor's note for illness will mitigate the penalties and allow me to re-arrange due dates.

The other component will be a series of Just-in-time (JIT) questions worth 10% of your grade. These will be managed through Canvas as an assignment and involve short answer questions or perhaps a small number of multiple-choice questions, if that helps decrease workload. They are called “just-in-time” as they will be turned on first thing in the morning (M&W) and you will answer the questions by 1 pm before class starts. This is meant to ensure you read material and get some credit for doing so, and you submit early enough so I get an opportunity to check how well you understood things before class begins. **You must answer these on your own without help from others.** *As these questions are linked to the particular class, there will be no makeup if you miss them or the deadline.*

Perusall and Research Papers: We will be reading primary research papers in order to expose you to the nature of scientific discovery and its contribution to developmental principles. Admittedly, reading research papers is challenging as students are not really the intended audience. To ease this burden and let you help each other, I am adopting a new Canvas plug-in called ‘Perusall.’ I upload a pdf copy of the research paper to this platform and you then work collaboratively to read through the paper creating threads of comments on the work. I am told that many students enjoy the collaborative nature and as the prof gets to see these ahead of time, it will also help us in our class discussion. It is automated, often prompting you and advising you, and it uses its own algorithm to assess the quality, number etc of your comments. This feedback helps you improve your reading skill as the semester progresses. Handouts will explain this further. Each paper is relatively low stakes (5 pts), and I anticipate we will cover about 10 or so papers by the end of the semester. These will accumulate to 10% of your grade. Papers you read as part of your presentation are NOT included in this calculation. *As this is a new thing for all of us, if it does not work well the prof will announce an end to its use. In this case, depending on when it happens, it will be totally dropped or re-calibrated to a smaller percentage, with the remaining worth assigned to either a new mechanism, or to your HW grade.*

Student presentations of a neuroplasticity research paper. This is a large-scale self-driven project worth 40% of your final grade. *Do not underestimate the time this project will take!* Start early, so you can get feedback from prof as needed. [And finishing early is always a nice feeling.]

You will work with prof to identify an appropriate neuroplasticity topic at least partially related to the class. Although you will read additional papers for background, you will submit a summary and critique of a specific research paper related to your topic. It will be worth 30% of your grade but this includes several factors, as outlined below. You will then convert this into an oral presentation (~10 min) to the class for 7% of your grade and defend your project to the prof (for 3%) via Zoom. Deadlines and rubrics will be posted. If the oral presentations in a class setting becomes untenable (for whatever reason), students will convert their presentation into a video recording and submit it for on-line viewing. Prof must OK the plasticity topic and actual research paper and will do so on a first come first serve basis. Similar topics cannot be covered by multiple students.

Given its scope and importance, several intermediate deadlines are provided in a separate handout. This also allows prof to provide timely feedback. Some intermediate deadlines will be worth specific points towards your grade on the project (e.g. a full draft version after March break), while others will simply have penalties attach for tardiness. A final version is submitted near the end of the semester, close to the same time you will be giving a short oral presentation to your classmates. We will also set up a time for an oral

defense of your work: this will likely be outside of normal class hours. more detailed outlines and grading rubric will be made available shortly after the class begins.

Plagiarism: Given the copious amounts of writing you will be doing a reminder about plagiarism is warranted. **Plagiarism is against the law!** This includes copying from each other for HW components. You will get a 50% reduction on the whole assignment the first time you do so, a zero the second time, and an F in the class a third time (without recourse to dropping class). If it occurs on your final written presentation you will receive an F on that work. Moreover, in science we almost never directly quote the work (i.e. put it into quotes and cite) as is typically done in liberal art classes. As scientists, albeit young ones, you are required to paraphrase what authors said/did and then cite what you are paraphrasing. The reference list provides the full information of citations.

Help: The WSU library has a number of helpful guides to improve writing and avoiding plagiarism: See <https://guides.lib.wayne.edu/writing> for more information and a self-help plagiarism check. This site also has lots of information on improving your writing.

In addition, if you get frustrated over lower than expected grades on the HW be sure to contact prof for a mutually convenient time to go over your specific work. This is available at any time and highly recommended. **Importantly, if you are struggling with your research project seek help early and often as you cannot wait until the end.**

Challenge option: To discuss specific grades on an assignment as part of a potential regrade, you must do so within one week of getting it back otherwise it is finished. Math errors can simply be pointed out and will be adjusted. However, be careful when exercising this option as I have no patience with the “point game” - it’s about accuracy and completeness, not an opportunity to bolster points.

I acknowledge that some subjectivity occurs when grading this kind of written work. Over the years I have learnt that this can be minimized by carefully reading/evaluating exactly what you have written, and not giving credit for “reading between the lines.” Keep in mind that I am looking for an answer that reflects true understanding of the material, not just a download of phrases etc. You really help yourself by not doing the assignment at the last minute, and by carefully re-reading what you are asking me to grade: does it make sense, is it repetitive, does it actually answer the question and say what you mean? It also helps to read the question once or twice more, after you have possible answers in front of you. If you begin early enough, you can also ask the prof for clarification.

Individuals with Disabilities: If you have a documented disability that requires accommodations, you will need to register with Student Disability Services (SDS) for coordination of your academic accommodations. The SDS office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department or call 313-577-1851 or 313-577-3365 (TDD only). Once you have your accommodation in place, I will be glad to meet with you privately to discuss your needs. A delay in getting a SDS accommodation letter may hinder the availability or facilitation of those accommodations; it is in your best interest to process accommodation letters ASAP.

Religious Conflicts: If you have a conflict with any of the scheduled class or deadlines due to religious reasons, you must notify me in writing **by class time on Jan. 13, 2021, or within a day of an announced deadline.** Assuming you meet this deadline, every attempt will be made to find a mutually convenient solution, likely giving an extension without penalty.

ADD/DROP POLICY: I follow all university policies on adding or dropping this class. Contact a Biology Advisor for help in this area. Recall, you will receive an “F” if you fail to do the administration work required to drop the class. **Last day to drop the class this semester is Sun March 28, 2021.** If you drop the course, you will be assigned WP, WF or WN as appropriate, and I will only use HW grades to assess this as the final project will not be available. Any “I” given to a student will automatically revert to “F” if the work is not completed within one calendar year. No exceptions [see: <http://sdcl.wayne.edu/RegistrarWeb/Registrar/policies.htm>.]

UNEXPECTED UNIVERSITY CLOSURES: If the University is **officially** closed on class day any deadline will automatically be moved to next class. If it prevents us from doing an oral presentation in class the student will submit a ppt video of their presentation by end of semester. Closure of the University is announced by the following mechanisms:

1. The University News line (313) 577-5345 *
2. WSU Homepage (www.wayne.edu) *
3. WSU Pipeline (www.pipeline.wayne.edu) *
4. WDET-FM (Public Radio 101.9)
5. WSU emergency broadcast system
6. by other local radio and television stations

In case of closure, monitor our Canvas site, as I will post, as necessary, specific information related to the class.

Disputes that cannot be resolved following the guidelines present in this syllabus will be resolved by following the guidelines of the University "Student Due Process".

(very) Tentative Class schedule:

Given a new textbook and the remote environment, I am reluctant to set up a full lecture schedule in order to make sure we keep enough flexibility and an appropriate pace. Generally speaking, I would prefer to cover fewer chapters in more depth with a reach focus, than many chapters in a cursory way.

Once we get going, I may be able to settle into a pace and be able to lay out more specific dates for you. Meanwhile, help remind me that I need to keep you aware of what is coming as each week unfolds.

As a rough idea, I expect to cover a textbook chapter during one lecture class, followed by a research paper the next class, - about one per week, at least after we get started. With one exception (chp 4 before 3), we will also follow the order of the chapters in the textbook.

Chp 1 : overview (briefly 1st class)

Chp 2: Neural Induction (week 1 & 2)

Chp 4: Patterning DV axis

Chp 3: Segmentation AP axis

Chp 5: Proliferation and Migration

Chp 6: Cell Determination

Chp 7: Neurite Outgrowth

Chp 8: Neuronal Survival/& death

Chp 9: Synapse Formation NMJ

Chp 10: Synapse Formation CNS

A full schedule for your research project, with all deadlines, is provided in a separate handout.

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0426 State Hall

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Although we will meet at the same time, technically, Bio7890 is a separate class from the 5890 version describe above and requires its own syllabus. As such, with the exceptions outlined below, all of the information provided above for Bio5890 are in effect for Bio7890. The general course structure and activities are as outlined, and you are expected to fully engage in all of these activities. You will be graded on the same scale and must adhere to all deadlines as stated.

However, to calculate your final grade in the 7890 class, I have raised the value of the written research project to 35% and compensated for this by decreasing the Perusall to 5% (assuming that as graduate students you enjoy reading research papers anyway). But I must emphasize that your participation in the Perusall platform is important and likely helpful to both you and your other classmates.

Thus, you're the final grade calculation for graduate students (Bio7890) is slightly different, and of course you should be aware that a C is a failing grade.

The value of your written research project has been increased to reflect a slight change in its scope, as will be explained in more detail once instructions and rubrics are released. Briefly, your introduction section should be longer reflecting additional reading to fill in more background, and the critique section will include evaluation of a second paper from a different lab considering aspects of the same process under discussion.

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