



Biology 466/566 – Developmental Neurobiology – Spring 2019

Instructor: Adam Miller

Class meeting: TR 14:00-15:20 pm Science Library B040 PSC

Office hours: by appointment in 314 Huestis

acmiller@uoregon.edu; for correspondence **please use Bi466/566 in the subject line**

Course description: This course will explore mechanisms underlying nervous system development and how these mechanisms fail in some neurodevelopmental disorders. The course is based on primary research literature, drawing on examples from different organisms to illustrate basic principles about cellular, molecular, and activity-dependent mechanisms underlying nervous system development. The course will emphasize critical reading of the literature and critical thinking. Students will be required to present papers from the literature and to complete regular homework assignments. During the course, students will develop original research proposals that will use the types of experimental approaches covered in the course to address unanswered questions about neural development. Students will present these proposals orally and submit them as a final written research project.

Learning objectives for all students:

- Gain an understanding of mechanisms underlying nervous system development, including similarities and differences between different animal taxa;
- Explore how alterations in some aspects of neural development can result in human neurodevelopmental disorders and the importance of animal research for elucidating underlying mechanisms;
- Become proficient at reading, discussing, and presenting primary research literature and critically evaluating data;
- Develop the ability to formulate hypotheses about the mechanistic bases for biological phenomena;
- Become proficient at designing experimental strategies to test hypotheses about the mechanistic bases for biological phenomena;
- Learn to give an oral presentation and to discuss primary research literature critically;
- Learn to give a concise and compelling oral presentation that identifies a scientific question, proposes a hypothetical answer to this question, and describes a novel experimental strategy to test this hypothesis;
- Learn to write a concise and compelling research proposal that identifies a scientific question, proposes a hypothetical answer to this question, and describes a novel experimental strategy to test this hypothesis

Course website: All course materials will be available through Canvas (canvas.uoregon.edu) under BI 466/566.

Course format: The course will be a combination of lectures, class exercises, discussions, and student presentations. Figures for presentations will be posted on Canvas before class. These figures are NOT a substitute for coming to class. Each of the classes builds upon the next, therefore it will be critical for you to get notes about the missed class from a colleague.

Graduate students will present several lectures throughout the term. These will be agreed upon by the Instructor and grad students, and will be developed with the Instructor to explore the concepts and explore the best practices in pedagogy.

Readings: Assigned readings for each class session are listed in the course syllabus. Pdf files for all assigned readings are posted on Canvas. In some cases, pdf files of papers that provide background or additional information are also posted on Canvas. To supplement the required readings, two books are on reserve in the Science Library: 1) SF Gilbert (2006) *Developmental Biology*, an excellent reference to review animal development; 2) DH Sanes, TA Reh & WA Harris (2006) *Development of the Nervous System*, an excellent reference for some aspects of nervous system development.

The syllabus is “tentative” because papers pertinent to the course will be chosen during the term, therefore we will use those papers instead of those listed in the syllabus; any changes will be announced in advance and will be listed on Canvas.

Grading policy – all work must be your own original work. Anything less will result in a Fail.

Homeworks: 24% There will be six homework assignments (each worth 4% of your grade) that will cover assigned readings and material covered in class. There is a standard format for homework that will be discussed in class and a template is available on Canvas. Each asks you to read and analyze the paper of interest for that day. Each homework is due at the beginning of class. *Late homework will not be accepted. You must do your own work, no exceptions.*

Class Participation: 26% Class participation is crucial for the success of this course. This portion of the grade will be made up of assignments (critiques of presentations and feedback on proposals, 8 total, 2% each) as well as attendance and in class participation. Attendance will be taken and students will be expected to come to class having reading and thought about the assigned material and prepared to participate in all class activities. As you read the assigned articles, please keep in mind that some of the topics we will cover are controversial. Therefore, you should think critically about what you are reading, continually question how the authors of an article arrived at their conclusions, what assumptions they made, whether their data seem credible, and what future experiments could support or refute their conclusions. This type of critical thinking will be necessary for your original research proposal.

Graduate students will present lectures, lead discussions, and be expected to guide a sophisticated discussion of how to be a working scientist.

Research article presentation: 10% Each student will work in a small group (typically 1-4 students, dependent on class size) to present a research article or articles to the class. The articles that will be discussed in the student presentations are listed in the course syllabus and posted on Canvas. These may change, depending on the number of students in the course; any changes will be announced in advance.

Graduate students will organize and lead the presentation groups.

Proposal assignments (40% total): Each undergraduate student will be required to write and to present an original research proposal that uses approaches similar to those covered in the course to address an unanswered question in the field of nervous system development. Students will develop their proposals throughout the course, as indicated on the class schedule.

Graduate students will work with 1-4 students, dependent on class size, to help guide, build, and evaluate research proposals.

The components of this proposal development process will contribute to the final course grade as follows:

- (1) Title, abstract, specific aims; (2) *REVISED* title, abstract, specific aims; (3) outlined experimental design & expected outcomes; (4) feedback on group member's aims, design and outcomes: **each 2.5%**

- Oral presentation: **10%**

- Written research proposal: **20%**

Office hours: I will not hold regular office hours, but I welcome talking with students by appointment. Please email me (acmiller@uoregon.edu) using **Bi466/566 in the subject line** to schedule an appointment. These will generally be schedule in the hour before or after class on Tuesday and Thursday.

Etiquette: Please arrive on time and engage fully in the course and content. Turn off your cell phone during class; use your computer only for class related activities.

Open inquiry, freedom of expression, and respect for difference are fundamental to a comprehensive and dynamic education. We are committed to upholding these ideals by encouraging the exploration, engagement, and expression of divergent perspectives and diverse identities. Classroom courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Our classroom is a learning environment, and as such should be a safe, inclusive and respectful place.

Inclusiveness: UO is working to create inclusive learning environments. Please notify me if there are aspects of instruction or design of this course that result in barriers to your participation. You may also wish to contact the Accessible Education Center (541-346-1155; usaec@uoregon.edu).

Academic Integrity: All students are expected to conform to the student conduct code (<http://dos.uoregon.edu/conduct> and <https://policies.uoregon.edu/vol-3-administration-student-affairs/ch-1-conduct/student-conduct-code>). As detailed in the policy, academic misconduct means the violation of university policy involving academic integrity. This includes cheating (“any act of deception by which a student misrepresents or misleadingly demonstrates that the student has mastered information on an academic exercise that the student has not mastered”), and plagiarism (“using the ideas or writings of another as one’s own.”) The instructor has a zero tolerance policy for academic dishonesty. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. You are encouraged to discuss ideas with each other. However, all submitted written work, including answers to homework questions and components of the research proposal must be your original work. Proper citation of sources is required in all written work and oral presentations.

Campus resources to support your learning

Tutoring and Academic Engagement Center (<https://engage.uoregon.edu/services/>) Drop-in math and writing support in addition to tutoring, study skills support, and Class Encore. Located in the 4th Floor Knight Library (541) 346-3226, engage@uoregon.edu.

Counseling Center Call anytime to speak with a therapist who can provide support and connect you with resources. Located on the 2nd Floor of the Health Center(541)346-3227

Accessible Education Center The University of Oregon is working to create inclusive learning environments. The instructor believes strongly in creating inclusive learning environments. If there are aspects of the instruction or design of this course that result in barriers to your participation, please notify us as soon as possible. You are also encouraged to contact the Accessible Education Center. If you are not a student with a documented disability, but you would like for us to know about class issues that will impact your ability to learn, we encourage you to come visit during office hours so that we can strategize how you can get the most out of this course. Located on the 1st Floor of Oregon Hall (541) 346-1155, uoaec@uoregon.edu

Center for Multicultural Academic Excellence (CMAE) mission is to promote student retention and persistence for historically underrepresented and underserved populations. We develop and implement programs and services that support retention, academic excellence, and success at the UO and beyond. We reaffirm our commitment to all students, including undocumented and tuition equity students. Located on the 1st Floor of Oregon Hall (541) 346-3479, cmae@uoregon.edu

The *UO Access Shuttle* is an on-campus ride service provided at no cost to students with conditions that limit mobility. More information and a sign-up form can be found on the parking & transportation department website: <https://parking.uoregon.edu/content/access-shuttle>.

Discrimination and Harassment*Prohibited Discrimination and Harassment*

Any student who has experienced sexual assault, relationship violence, sex or gender-based bullying, stalking, and/or sexual harassment may seek resources and help at safe.uoregon.edu. To get help by phone, a student can also call either the UO's 24-hour hotline at 541-346-7244 [SAFE], or the non-confidential Title IX Coordinator at 541-346-8136. From the SAFE website, students may also connect to Callisto, a confidential, third-party reporting site that is not a part of the university.

Students experiencing any other form of prohibited discrimination or harassment can find information at respect.uoregon.edu or aaeo.uoregon.edu or contact the non-confidential AAEO office at 541-346-3123 or the Dean of Students Office at 541-346-3216 for help. As UO policy has different reporting requirements based on the nature of the reported harassment or discrimination, additional information about reporting requirements for discrimination or harassment unrelated to sexual assault, relationship violence, sex or gender based bullying, stalking, and/or sexual harassment is available at [Discrimination & Harassment](#).

Reporting

The instructor of this class is a Student-Directed Employee. As such, if you disclose to me, I will respond to you with respect and kindness. I will listen to you, and will be sensitive to your needs and desires. I will not judge you. I will support you. As part of that support, I will direct students who disclose sexual harassment or sexual violence to resources that can help. I will only report the information shared to the university administration when you as the student requests that the information be reported (unless someone is in imminent risk of serious harm or is a minor). Please note the difference between 'privacy' and 'confidentiality.' As a Student-Directed Employee I can offer privacy because I am not required to report certain information to the university. However, I cannot be bound by confidentiality as is the case with a counselor or attorney. Confidential resources mean that information shared is protected by federal and state laws. Any information that I as a student-directed employee receive may still be accessed by university or court proceedings. This means, for example, that I could still be called as a witness or required to turn over any related documents or notes that I keep.

Please note also that I am required to report all other forms of prohibited discrimination or harassment to the university administration. Specific details about confidentiality of information and reporting obligations of employees can be found at titleix.uoregon.edu.

Mandatory Reporting of Child Abuse

UO employees, including faculty, staff, and GEs, are mandatory reporters of child abuse. Child abuse pertains to individuals who are under the age of 18. This statement is to advise you that your disclosure of information about child abuse to the instructor may trigger my duty to report that information to the designated authorities. Please refer to the following links for detailed information about mandatory reporting: [Mandatory Reporting of Child Abuse and Neglect](#).

Safe Ride**541-346-7433 ext 2**pages.uoregon.edu/saferide

Safe Ride is an assault prevention shuttle that works to provide free, inclusive, and accessible alternatives to traveling alone at night for UO students, faculty, and staff.

We are a schedule-ahead service and riders can (1) call once we open to schedule a ride with a dispatcher or (2) leave a voicemail on the day of their ride request. We do not call riders ahead of time to confirm due to capacity constraints, but riders are always welcome to call us to double-check that their ride was scheduled. We are a feminist, 'for-the-students/by-the-students' organization and operate out of the Women's Center in EMU 12F.

k	y	Class	Date	Learning objective	Readings	Homework	Presentations	Proposal deadlines
Nervous system patterning and specification								
Adam	1	Tu	1	2-Apr	Explain nervous system induction	Background readings: Hogan (1995); Weinstein (1997); Sanes et al. (2006) Nordstrom et al. (2002) [background reading: New (1955)]	Homework due Nordstrom	
		Th	2	4-Apr	Learn how the anteroposterior axis is established			
Grad1, Abbey	2	Tu	3	9-Apr	Learn how the dorsoventral axis is established	Briscoe & Ericson (2000); Helms & Johnson (2003); Le Dreau & Marti (2012)	Homework due as assigned (1/2 one paper, 1/2 other)	Group 1
		Th	4	11-Apr	Vertebrate motoneuron specification			
Neural stem cells and glia								
Grad2, Tanner	3	Tu	5	16-Apr	Understand stem cells and glia	Taupin & Gauge (2002); Alvarez-Buylla et al. (2001); Fields (2004); Abdullah et al. (2012) Doe & Goodman (1985); Isshiki et al. (2001) [additional background: Skeath (1999)]	Homework due - written critique on previous presentation	Group 2
		Th	6	18-Apr	Describe temporal patterning of insect neuroblasts			
Axon guidance, neuronal survival, and synapse & circuit formation								
Grad3, Rachel	4	Tu	7	23-Apr	Learn about axon guidance & synapse formation	Chilton (2006); Dickson (2002); Petzoldt & Sigrist (2014) [additional background: ScienceDaily ASD1 & Arons et al. (2012)]	Homework due - written critique on previous presentation	Group 3
		Th	8	25-Apr	Discuss the role of synaptic proteins in autism			
Activity dependent effects on circuit refinement								
Grad4, Jonny	5	Tu	9	30-Apr	TBD - Jonny we need to figure this out	TBD	Homework due - written critique on previous presentation	Group 4
		Th	10	2-May	TBD - Jonny we need to figure this out	TBD	Homework due TBD	
Microbial influences on neural development								
Grad5, Sarah	6	Tu	11	7-May	Learn how microbes affect host neural development	Heijtz et al. (2011)	Homework due - written critique on previous presentation	Proposal title, abstract, specific aims
		Th	12	9-May	Discuss the role of host-associated microbes in autism	Hsiao et al. (2013)	Homework due Hsiao	
Grad student topics								
Grad1, Abbey	7	Tu	13	#####	Journal Club	TBD	Homework due - written critique on previous presentation	Revised title, abstract, specific aims
		Th	14	#####	Journal Club	TBD	You are required to	
Grad2, Tanner	8		15	#####	Journal Club	TBD	participate in the	Outlined experimental design & expected
		Th	16	#####	Journal Club	TBD	discussion of each	
Grad3, Rachel	9	Tu	17	#####	Journal Club	TBD	of these papers	
			18	#####	Journal Club	TBD		
Proposal presentation and writing workshop								
UGs	9	Th	18	#####	Proposal writing workshop: refining experiment design	Group discussions of experimental aims and expected outcomes	Feedback on 3 proposals	
Research proposal presentations								
UGs	10	Tu	19	4-Jun	Research proposal presentation	10min each		Students 1-5
		Th	20	6-Jun	Research proposal presentation	10min each		Students 6-10
11				FINAL	???	WRITTEN RESEARCH PROPOSAL DUE BY THE END OF THE SCHEDULED FINAL TIME		