

**BISP194/BGGN285 W12023: “Biological Determinants of Sex and Gender”
Wednesdays 4:30-5:50 York 3010**

How do X and Y chromosomes determine biological sex in mammals? How is this process modified to produce intersex outcomes? How are the brains of XX and XY mammals different anatomically and functionally? Can we connect these differences to gender? We will read and discuss primary research literature addressing these topics.

Instructor: Prof. Laurie G. Smith (lgsmith@ucsd.edu)

Office hours Tuesdays 6-7pm on Zoom (<https://ucsd.zoom.us/j/4148552767>) or by appointment

Class expectations (one weekly cycle described):

- Each class period will end with a 15-30 minute lecture providing background for understanding the next week’s assigned reading (research article)
- Supplement the lecture with recommended background reading/videos as needed
- Take a Canvas quiz on the background lecture + reading (available Sat. 4pm -Tues 4pm). You are welcome (encouraged!) to consult your lecture notes/posted lecture slides + background readings as needed during these quizzes, but must finish them in 30 minutes (expected time for reviewing background and taking quiz = 1-2 hrs)
- Complete the assigned reading (research article) prior to the class period where it will be discussed. Comment on the reading using Perusall (submit comments by 4pm Wed; expected time for reading and commenting = 1-2 hrs)
- Participate in structured discussions of assigned reading (research article) during class. Discussion questions will be posted on Canvas shortly before class. To facilitate your participation, please bring a laptop or tablet to class giving you access to the article and discussion questions, and allowing you to compose your answers during class (~1 hr).
- Submit answers to discussion questions by 4pm Friday (expected time to complete <1 hr since you should be able to formulate and write out your answers during class)
- Total time expected per week = 4-6 hrs including class time

Grades will be based on four components (note that there are no exams):

A for BISP 194 students only: 28% of your grade will come from weekly Canvas quizzes, with the lowest score dropped.

A for BGGN 285 students only: 28% of your grade will be based on a paper written on an article you select and recommend for future offerings of this class. The article should fit the themes of this class but explore a different aspect or extend a discovery you read about in class. More details on this assignment will be communicated to you via Canvas messaging. Due Friday Mar. 24 at midnight (submit via Canvas).

B (all students): 16% of your grade will be based on your annotations of assigned readings on Perusall with the lowest score dropped

C (all students): 56% of your grade will be based on answers to questions on assigned readings, which you will work on with a group in class each week during scheduled class time. Discussion questions will be posted on Canvas before class. Answers will be submitted via Canvas each week by 5pm Thursday, the day after the corresponding class session (note that you can submit your answers during class). It is expected that your answers to weekly discussion questions will benefit from discussion with other students and the instructor but your submitted answers should be composed by you. The lowest score will be dropped.

Grading scale: 90-100% A 80-89% B 70-79% C 60-69% D <60 F

If needed, the above thresholds for each grade will be adjusted downward so that most if not all students receive an A or a B. The thresholds will not be adjusted upward (making it harder to earn a given grade) for any reason.

Background knowledge is assumed in the following areas. Please use the links provided as a refresher if you're hazy on these techniques and concepts!

- How PCR works: https://www.youtube.com/watch?v=mOKb0Pd_Rac
- Gene structure/basic concepts of gene regulation function (promoter/enhancer, introns vs. exons, central dogma i.e. DNA transcribed into mRNA; processed mRNA translated into proteins): <https://www.nature.com/scitable/topicpage/gene-expression-14121669/>
- What is a transcription factor: <https://www.nature.com/scitable/topicpage/transcription-factors-and-transcriptional-control-in-eukaryotic-1046/>
- What are hormones:
 1. Overview: <http://www.vivo.colostate.edu/hbooks/pathphys/endocrine/basics/hormones.html>
 2. Mechanism of action of gonadal hormones (with intracellular receptors): <http://www.vivo.colostate.edu/hbooks/pathphys/endocrine/moaction/intracell.html>
- What is a transgenic organism and how is it constructed: [https://bio.libretexts.org/Bookshelves/Genetics/Book%3A_Online_Open_Genetics_\(Nickle_and_Barrette-Ng\)/08%3A_Techniques_of_Molecular_Genetics/8.7%3A_Transgenic_organisms](https://bio.libretexts.org/Bookshelves/Genetics/Book%3A_Online_Open_Genetics_(Nickle_and_Barrette-Ng)/08%3A_Techniques_of_Molecular_Genetics/8.7%3A_Transgenic_organisms)

Topics outline (tentative schedule):

Week 1 (Wed. Jan. 11) Meet and greet. Review course goals and topics, sex vs. gender, use of Perusall... end with background lecture for week 2.

Week 2 (Wed. Jan. 18) SRY and mammalian sex determination

Week 3 (Wed. Jan. 25) Alternate master regulators of biological sex in other vertebrates

Week 4 (Wed. Feb. 1) Role of DMRT1/FOXL2 in maintenance of biological sex in mammals

Week 5 (Wed. Feb. 1) How do intersex outcomes happen humans?

Week 6 (Wed. Feb. 8) Male vs. female brain differences in humans: structural features

Week 7 (Wed. Feb. 15) Male vs. female brain differences in humans: functional studies

Week 8 (Wed. Feb. 22) Impact of hormones on male vs. female brain differences in mammals

Week 9 (Wed. Mar. 1) Impact of immune cells (microglia and mast cells) on "brain sex" in mice

Week 10 (Wed. Mar. 8) The transgender brain