FALL 2020: SEMINAR IN GENE REGULATION

COURSE NUMBERS

Hunter Undergraduate: BIOL 471.93
Hunter Graduate (M.A.): BIOL 790.52
CUNY Graduate Center (Ph.D.): BIOL 793.03

PROFESSOR: Armin Lahiji OFFICE HOURS: Wed 8:25-9:25 PM
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The student learning goals for this seminar course are:
1. To enhance participant familiarity with current literature on mechanisms of gene regulation
2. To enable students to recognize and formulate testable hypotheses based on existing data
3. To provide opportunities for students to develop skills in oral and written communication of research

Seminar course overview: In this course, we will be studying recent review and primary articles on various topics in gene regulation. In the first part of the course we will be going over articles as a group. During this period, students in the course will be independently researching a chosen topic for the purpose of writing a paper on that topic. The type of paper to be written for undergraduate and graduate students are as follows:

Undergraduates: A short synthetic review article with the following components:
Brief description of the chosen topic/process and its importance to development and/or disease
The state of knowledge of that field (what is known)
The most important unanswered questions (what is NOT known)
New hypothesis arising from your review that may address one of those unanswered questions
Explanation and synthesis of the key points of prior data that support the new hypothesis

Graduate students: A short research proposal to investigate a particular question relevant to mechanisms of gene regulation roughly following the NIH format:
A "Specific aims" page (introducing 1-2 related aims testing a hypothesis arising from your research)
Background, Significance, Experimental Plan, Expected outcomes and interpretations

During the second part of the course, students will make presentations of their plans for their paper/proposal. While students may pool efforts in research and sharing information, the paper must be an individual work**.**

An outline and drafts will be collected at various due dates during the semester as follows:
9/22 Paper prospectus due!!! (approved topic, outline and list of relevant references to be used)
11/3 First draft due, as complete at possible
11/24 Second complete draft due
Final draft due (as e-mail attachment) by 9:00AM on 12/15

COURSE GRADES WILL BE CALCULATED AS FOLLOWS:
FINAL PAPER--50%, CLASS PARTICIPATION--25%, PRESENTATION--25%

Class participation means reading and understanding the articles in advance of a given session, contributing regularly and meaningfully to the in-class discussions of them. Included in this component of the course is the submission of short written answers to a short list of general questions about the primary papers we will discuss in sessions 2 through 8. The answers relevant to the primary paper discussed in each session will be due and collected at the beginning of the session. This exercise is designed to help students recognize and understand the hypotheses that were the basis for beginning the work described in the paper.

SCHEDULE OF SESSIONS AND ARTICLE LIST (please note: no class on 10/1 and 10/8)

9/1 Session 1, Introduction and Organization
Review: Margueron, et. al. The key to development: interpreting the histone code? *Curr Opin Genet. Dev.* 2005, 15:163-176.

9/8 Session 2, Recognition of histone modifications
Review: Chi, et. al. Covalent histone modifications – miswritten, misinterpreted and mis-erased in human cancers. *Nature Rev. Cancer.* 2010, 10:457-469.

Primary: Wysocka, et. al. A PHD finger of NURF couples histone H3 lysine 4 trimethylation with chromatin remodeling. *Nature*. 2006, 442:86-90.

9/15 Session 3, Transcription and the "histone code"
Review: Berger. The complex language of chromatin regulation during transcription. *Nature*. 2007, 447:407-12.

Preview: Lorincz and Schubeler. RNA polymerase II: Just dropping by. *Cell*. 2007, 130:16-18.

Primary: Guenther, et. al. A chromatin landmark and transcription initiation at most promoters in human cells. *Cell*. 2007, 130:77-88.

9/22 Session 4, Transcription "pause" and "release"
Review: Chiba, et. al. Promoter-proximal pausing and its release: Molecular mechanisms and physiological functions. *Exp. Cell Res*. 2010, 316:2723-30.

Preview: Price. Regulation of RNA polymerase II elongation by c-myc. *Cell*. 2010, 141:399-340.

Primary: Rahl, et. al. c-Myc regulates transcriptional pause release. *Cell*. 2010, 141:432-445.

10/06 Session 5, DNA methylation: PAPER PROSPECTUS DUE!
Review: Bogdanovic and Veenstra. DNA methylation and methyl-CpG binding proteins: developmental requirements and function. *Chromosoma* 2009, 118:549-565.

Primary 1: Nan, et. al. Transcriptional repression by the methyl-CpG-binding protein MeCP2 involves a histone deacetylase complex. *Nature*. 1998, 393:386-9.

Primary 2: Fuks F, et. al. The methyl-CpG-binding protein MeCP2 links DNA methylation to histone methylation. *J. Biol Chem*. 2003, 278:4035-40.

10/13 Session 6, Small RNAs and gene regulation
Review: Farazi, et. al. The growing catalog of small RNAs and their association with distinct Argonaute/Piwi family proteins. *Development*. 2008, 135:1201-1214.

Primary: Giles, et. al. Maintenance of a constitutive heterochromatin domain in vertebrates by a dicer-dependent mechanism. *Nature Cell Biol*. 2010, 12:94-99.

10/20 Session 7, Boundary/Insulator elements
Review: Barkess and West. Chromatin insulator elements: establishing barriers to set heterochromatin domain boundaries. *Epigenomics*. 2012, 4:67-80.

Primary: Dickson, et. al. VEZF1 elements mediate protection of DNA methylation. *PLoS Genetics*. 2010, 6(1):e1000804.

10/27 Session 8, Chromatin Looping and Gene Regulation
Review: Deng and Blobel. Do chromatin loops provide epigenetic gene expression states? *Curr. Opin. Genet. Dev*. 2010, 20:548-554.

Primary: Deng, et. al. Controlling long-range genomic interactions at a native locus by targeted tethering of a looping factor. *Cell*. 2012, 149:1233-1244.

11/3 Session 9, Student presentations: FIRST DRAFT OF PAPER DUE!

11/10 Session 10, Student presentations

11/17 Session 11, Student presentations

11/24 Session 12, Student presentations: SECOND DRAFT OF PAPER DUE!

12/1 Session 13, Student presentations

12/8 Session 14, Leftovers and discussion: FINAL PAPER DUE on 12/15!

Hunter College Academic Integrity Policy: 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.

ADA Policy: In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical and/ or Learning) consult the Office of AccessABILITY located in Room E1124 to secure necessary academic accommodations. For further information and assistance please call (212- 772- 4857)/TTY (212- 650- 3230).

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a. Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College's Public Safety Office (212-772-4444).

b. All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College's Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123. CUNY Policy on Sexual Misconduct