EPIGENETICS

BIOL483/CAMB483

Prerequisite: BIOL 221.

Fall 2019

Instructor: Doris Wagner (wagnerdo@sas.upenn.edu) 215-898-0483

office hours: Tue after class and by appointment

TAs:

Agosto-Rosa, Laura C lauag@pennmedicine.upenn.edu

office hours: By appointment, after class and Wednesdays 4:30-6:30 in the Van Pelt Library (room TBA weekly)

Szurgot, Mary mszurgot@pennmedicine.upenn.edu

office hours: Thursday after class, by appointment,
and 10AM-12PM Mondays in Smilow (SCTR) 12-120 (small conference room)

Course Description

This course investigates epigenetic phenomena: heritable alternate states of gene activity that do not result from an alteration in nucleotide composition (mutations).

Epigenetic mechanisms regulate normal development and their dysregulation has been implicated in a variety of diseases including cancer and behavioral disorders.

Recently it has become apparent that Epigenetics is the interface between the environment and the genomic information; epigenetic mechanisms are important for proper stress responses. Amongst the epigenetic mechanisms we will discuss in this course are chromatin assembly and remodeling, histone modifications, DNA methylation, polycomb repression, non-coding RNAs and 3D chromatin organization. The class size is limited to 40 students.

Textbook

NO textbook is needed. Background information is provided in the lecture and through review articles posted on Canvas.

Website

The Canvas course website will be our main website and is only available to class participants. Under "Class content" you will find the slides for my lectures and for the guest lectures. The scientific articles we will discuss and additional assigned readings will also be posted at this site.

Course format

The course is divided into eight topics: Chromatin assembly, Chromatin remodeling, Histone modifications, Histone variants, DNA methylation/imprinting, Polycomb repression, RNA directed silencing mechanisms/X inactivation and 3D Chromatin organization. Each topic will be covered by a lecture, student investigation of one to two recent publications, and guest research as well as guest methods talks by invited faculty speakers from across campus. No prior knowledge of Epigenetics is needed. The lectures are aimed at giving relevant background information needed. Students will work with the current scientific literature both on their own (TA corrected assignments) as well as in groups in class followed by discussions. This course format emphasizes critical analysis of the papers being discussed with focus on the current open questions in Epigenetics and how they are being addressed experimentally.

Grading

For undergraduates, 30% of your grade will be based on your **paper analysis assignment and group work**. 10 % will be based on **participation,** in class discussions including paper discussion and in class discussion, also entries into the epigenetics methods google sheet. 60% of your grade will also be based on your **exams** (two midterms).

For g**raduate students (everyone with a bachelors degree)** 30% of your grade will be based on your **paper analysis assignment and group work**. 10 % will be based on **participation,** in class discussions including paper discussion and in class discussion, also entries into the epigenetics methods google sheet. 45% of your grade will also be based on your **exams** (two midterms). In addition, you will be asked to write a **short research proposal** as the final assignment worth 15% of your grade.

	1:30- 2:10	2:10 2:50
27-Aug	Epigenetics and chromatin assembly	Epigenetics and chromatin assembly (lecture)
29-Aug	Chromatin assembly paper 1 (paper with assignment)	Chromatin assembly paper 1 (paper discussion)
3-Sep	**Methods: Nucleosomal arrays (Ken Zaret)**	Chromatin remodeling 1
5-Sep	Chromatin remodeling 2	Chromatin remodeling paper1
10-Sep	Chromatin remodeling paper2	Covalent histone modifications 1
12-Sep	Covalent histone modifications 2	**Research lecture histone modifications (Shelley Berger)**
17-Sep	Paper histone modification paper 1	Histone variants 1
19-Sep	Histone variants 1	Paper histone modification paper 2
24-Sep	Histone variants paper 1	**Methods: Mass Spec analysis of histone proteins (Ben Garcia)+**
26-Sep	**Research Lecture Histone variants (Ben Black)**	Recitation 1
1-Oct	**Methods epigenomic analysis (Run Jin and Sammy Klasfeld; Wagner lab)**	Recitation 2
3-Oct	Midterm 1	
8-Oct	Silencing mechanisms/DNA methylation 1	**Detection of DNA modifications (Hao Wu)**
15-Oct	Silencing mechanisms/DNA methylation 2	DNA me paper1
17-Oct	DNA me paper 2	RNA-mediated silencing 1
22-Oct	RNA-mediated silencing 2	**role of nc RNA in epigenetics (Montserrat Anguerra)**
24-Oct	**Methods for RNA detection (BrianGregory)**	RNA paper1
29-Oct	RNA paper2	**Imprinting (Bartolomei)**
31-Oct	Polycomb repression 1	Polycomb repression paper1
5-Nov	Polycomb repression 2	Polycomb repression paper 2
7-Nov	**Polycomb repression (Roberto Bonasio)**	3-D chromatin organization
12-Nov	**Mia Levine evolution of HP1**	HP1 paper
14-Nov	3-D chromatin organization	**Methods for Chromatin conformation - (Zoltan Simandi; Phillips- Cremins lab)**
19-Nov	**Methods for nuclear architecture (Eric Joyce)**	3-D chromatin organization paper 1
21-Nov	3-D chromatin organization paper 2	Hot topics/experiments
26-Nov	**Nuclear pore (Maya Capelson)**	Recitation 1
3-Dec	Hot topics/experiments	Recitation 2
5-Dec	Midterm 2	