Gene Expression (BioSc 2155)
Spring 2014, Arndt
Tuesday 2:00-3:50 PM, 241 Crawford Hall

Date	Topic / Papers	Speakers
January 7	Introduction to course Lecture: RNA polymerase II	Arndt
January 14	Lecture: The general transcription machinery	Arndt
January 21	Bataille et al. (2012) A universal RNA polymerase II CTD cycle is orchestrated by complex interplays between kinase, phosphatase, and isomerase enzymes along genes. *Mol. Cell* **45**: 158-170 Suh et al. (2013) The C-terminal domain of Rpb1 functionson other RNA polymerase II subunits. *Mol. Cell* **51**: 850-858 Venters and Pugh (2013) Genomic organization of human transcription initiation complexes. *Nature* **502**: 53-58.	Daniel Totten Zhihao Sun Sarah Smith
January 28	Lecture: Activators and Coactivators	Arndt
February 4	Sainsbury et al. (2013) Structure and function of the initially transcribing RNA polymerase II–TFIIB complex. *Nature* **493**: 437-440. Fishburn et al. (2005) Function of a eukaryotic transcription activator during the transcription cycle. *Mol. Cell* **18**: 369-378. Brzovic et al. (2011) The acidic transcription activator Gcn4 binds the mediator subunit Gal11/Med15 using a simple protein interface forming a fuzzy complex. *Mol. Cell* **44**: 942-953.	Amber Griffith Roni Lahr Tony Amorosa
February 11	Whyte et al. (2013) Master transcription factors and mediator establish super-enhancers at key cell identity genes. *Cell* **153**: 307-319. Kagey et al. (2010) Mediator and cohesin connect gene expression and chromatin architecture. *Nature* **467**: 430-435. Revyakin et al. (2012) Transcription initiation by human RNA polymerase II visualized at single-molecule resolution. *Genes Dev.* **26**: 1691-1702.	Melissa Plakke Travis Mavrich Elizabeth Hildreth
February 18	*No Class (instructor recovering from surgery)*	
February 25	Lecture: Chromatin	Arndt
March 4	Whitehouse et al. (2007) Chromatin remodelling at promoters suppresses antisense transcription. *Nature* 450: 1031-1035. Hughes et al. (2012) A functional evolutionary approach to identify determinants of nucleosome positioning: a unifying model for establishing the genome-wide pattern. Mol. Cell 48: 5-15. Keogh et al. (2005) Cotranscriptional Set2 methylation of histone H3 lysine 36 recruits a repressive Rpd3 complex. *Cell* **123**: 593-605.	Chong Dai Paul Crawford Hillary Cleveland
March 11	*No Class*	*Spring Break*
March 18	Lee and Li (2013) Chromatin remodelers fine-tune H3K36me-directed deacetylation of neighbor nucleosomes by Rpd3S. *Mol. Cell* **52**: 255-263. Milne et al. (2010) Multiple interactions recruit MLL1 and MLL1 fusion proteins to the HOXA9 locus in leukemogenesis.	Stefan Brooks Dominique Barbeau Zhihao Sun

	Mol. Cell **38**: 853-863. Wu et al. (2013) ASH2L regulates ubiquitylation signaling to MLL: trans-regulation of H3 K4 methylation in higher eukaryotes. *Mol. Cell* **49**: 1108-1120.	
March 25	Filippakopoulos et al. (2010) Selective inhibition of BET bromodomains. *Nature* **468**: 1067-1073. Lauberth et. al. (2013) H3K4me3 Interactions with TAF3 regulate preinitiation complex assembly and selective gene activation. *Cell* **152**: 1021-1036. Kaplan et al. (2012) Dissection of Pol II trigger loop function and Pol II activity–dependent control of start site selection in vivo. *PLoS Genetics* **8**: e1002627	Sarah Smith Melissa Plakke Travis Mavrich
April 1	Lecture: Transcription elongation	
April 8	Churchman and Weissman (2011) Nascent transcript sequencing visualizes transcription at nucleotide resolution. *Nature* **469**: 368-373. Kwak et al. (2013) Precise maps of RNA polymerase reveal how promoters direct initiation and pausing. *Science* **339**: 950-953. Kaplan et al. (2003) Transcription elongation factors repress transcription initiation from cryptic sites. *Science* **301**: 1096-1099.	Elizabeth Hildreth Chong Dai Paul Crawford
April 15	Martinez-Rucobo et al. (2011) Architecture of the RNA polymerase–Spt4/5 complex and basis of universal transcription processivity. *EMBO J.* **30**: 1302-1310. Liu et al. (2009) Phosphorylation of the transcription elongation factor Spt5 by yeast Bur1 kinase stimulates recruitment of the PAF complex. *Mol. Cell. Biol.* **29**: 4852-4863. Dinant et al. (2013) Enhanced chromatin dynamics by FACT promotes transcriptional restart after UV-induced DNA damage. *Mol Cell.* (2013) **51**: 469-479.	Amber Griffith Roni Lahr Tony Amorosa
April 22	Porrua et al. (2012) *In vivo* SELEX reveals novel sequence and structural determinants of Nrd1-Nab3-Sen1-dependent transcription termination. *EMBO J.* **31**: 3935-3948. Schulz et al. (2013) Transcriptome surveillance by selective termination of noncoding RNA synthesis. *Cell* **155**: 1075-1087. Hazelbaker et al. (2013) Kinetic competition between RNA polymerase II and Sen1-dependent transcription termination. *Mol. Cell* **49**: 55-66.	Stefan Brooks Dominique Barbeau Hillary Cleveland

Course Description: In this course, we will discuss major topics in gene expression, focusing on transcription and transcription-coupled processes in eukaryotes. We will discuss key concepts in RNA synthesis and the role of chromatin and noncoding DNA in regulating gene expression. The format will be a mixture of lectures by the instructor and student-directed presentations of the primary literature.

Grading: Grades for this 2-credit course will be determined from 2 oral presentations (each contributing 25% to the final grade), class participation (20% of the final grade), and written reports (30% of the final grade).

Oral presentations: Students will give two oral presentations of assigned pap ers, using Power Point. Plan for the presentation to last 25 minutes without interruptions. During the actual presentation, students should ask questions. A ~10-minute question period will follow each oral presentation. Note: due to the large size of the class, 3 papers will be discussed per class period. It is essential that the speaker cover the most important points of the paper.

Each presentation must contain (1) an introduction, (2) a description of the hypotheses that are being addressed by the authors, (3) a description of the experiments including information on the methods, (4) a conclusion that briefly summarizes the paper and also gives an evaluation of the paper. Pay particular attention to why the authors performed the study (i.e. what gap in our knowledge were they hoping to fill?) and whether they were successful in achieving their goal(s). How does the information advance our understanding of gene expression?

Four written reports: On days they are not presenting, students will turn in a written report (**1 to 1.5 page, single space limit**) that relates to **one** of the three papers discussed that day. The report should provide a very brief summary of the paper to set up the problem, and **three Specific Aims** that explain how you think the work should be pursued. What questions do you think need to be addressed at the conclusion of this work? Propose an experimental line of investigation for each. Over the course of the semester, students should write **four** of these reports.