

Requirements for BISP 194: Eukaryotic gene expression in a post genomics era: Beyond the central dogma

PROFESSOR TRACY JOHNSON
5326 NATURAL SCIENCES BUILDING
johnsont@ucsd.edu

USEFUL MOLECULAR BIOLOGY TEXTBOOKS:

Molecular Cell Biology, 6th edition. Lodish et al. 2008.

Molecular Biology of the Cell (4th Ed., Alberts, Johnson, Lewis, Raff, Roberts & Walter)

MEETING TIME AND LOCATION: Monday, 4:00-5:20 PM. PAC HALL 3500

FINAL: The final exam will be held Friday March 18th from 3-6 P.M.

WEBSITE: <http://www.biology.ucsd.edu/classes/bisp194-3.WI11>

The course website contains:

- Syllabus
- Course schedule
- Papers for presentation (as PDF files)
- Presentation schedule
- Evaluation form
- "How to read a paper"
- Useful updates

PREREQUISITES: BICD100 (*Genetics*), BIBC100[02] (structural/metabolic biochemistry), and their prerequisites. Additionally, it is HIGHLY RECOMMENDED that you have completed BICD100 (*Genetics*) and BIMM100 (*Molecular Biology*) *before* taking this class.

COURSE SUMMARY:

Eukaryotic gene expression is elegantly controlled to allow for proper cellular function and to ensure that the cell can appropriately respond to changes in environmental conditions. In recent years, exciting discoveries have uncovered surprising mechanisms by which gene expression is regulated, including unexpected roles for many classes of noncoding RNAs. Here we will explore emerging models of eukaryotic gene expression and their implications for understanding cellular function and the molecular details underlying human disease. The goal of the course is that you will not only learn about these exciting new discoveries, but you will also learn to read, critically evaluate, and present primary data presented in research articles.

EVALUATION:

- (1) Oral group presentation of a research paper
- (2) Participation during discussions/written evaluations of presentations
- (3) $\frac{1}{2}$ -1 page summary/evaluation of 3 of the 7 assigned research papers (Do not write a summary for the paper you are presenting)

RESEARCH PAPERS

These are available at the course website as PDF files. Hard copies will not be handed out. The course schedule contains the list of research articles that will be presented in class by your classmates. Additionally, some review articles and articles with useful background are listed. You may, nonetheless, find that you need to do additional research in order to fully grasp the papers. I recommend that you utilize the molecular biology textbooks listed above as well as pubmed <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?DB=pubmed> if you'd like to do additional research.

PRESENTATIONS

PRESENTERS:

Each of you will be a member of a group that will make a 45-minute presentation of one of the assigned research papers. This includes approximately 35 minutes for the presentation and 10 minutes for questions and discussion. Each member of the group should be prepared to answer questions or engage in discussion of their portion of the presentation.

NONPRESENTERS:

You are expected to read EVERY paper *before* coming to class and to be prepared to discuss it. Participation during discussions will be part of your final evaluation.

After each of the presentations, you will fill out an evaluation (posted online) of the presentation including *constructive* comments on the group's presentation of the background material and data in each paper. Additionally, you will have a chance to observe and comment on presentation styles of the presenters. Excerpts of these comments (the most insightful and instructive) will be provided to the group as part of my evaluation and grade assignment.

PRESENTATION FORMAT

Each presenter should prepare between 2-5 overhead transparencies, handouts, chalkboard drawings, or powerpoint slides. If you do use powerpoint, you should bring your own computer (with the entire presentation on the one computer) and backup copy of the entire presentation on a CD or memory stick.

I. *Background/Introduction*—Provide the necessary background to give the audience a context for the paper. I.e. What are the authors attempting to show? How does this work fit into the broader view of the field? What tools are going to be used to approach the problem.

II. *Discussion of results /data* (You will probably find it most useful to divide the figures between the members of the group)--Provide a thorough description of the techniques described in the paper. Describe the specific experiment (Highlight any controls that are important for the interpretation of the data). Highlight the results of the experiment. Discuss any reservations you may have about the data.

II. *Conclusions and implications* -Discuss the conclusions of the paper. Where possible, include a model (often included at the end of the paper) to provide an overview of the findings. Discuss any caveats to the interpretation, and discuss the long-term implications of the work.

GROUP MEETINGS PRIOR TO PRESENTATION

Presenters are encouraged to exchange phone numbers and e-mail addresses and arrange multiple meetings to prepare your presentations. I suggest that each group meet at least twice before your presentation. These papers are complicated, and the level of background and experience within the class vary. Nevertheless, by working together, the group should achieve a common level of understanding of the techniques and results presented in the paper.

PEER EVALUATIONS

After each presentation, you will fill out a one-page evaluation of the talk (available on the course web site). Excerpts of the most insightful and instructive comments will be provided to the group as part of my evaluation and grade assignment.

$\frac{1}{2}$ -1-PAGE SUMMARY/EVALUATION OF PAPERS

At the beginning of class, you will turn in a summary and evaluation of the paper to be discussed. The write up should include a brief summary of the authors' work, an analysis of the results, and an evaluation of how well the authors support their claims. If there are problems with the authors' analyses, these should be discussed. Although each individual should turn in his or her own write-up, I encourage you to discuss the papers among yourselves.

WELCOME TO BISP 194!

EUKARYOTIC GENE EXPRESSION IN A POST GENOMICS ERA: BEYOND THE CENTRAL DOGMA

<u>Date</u>	<u>Lecture Topics:</u>
1/3	Course Introduction Introduction to eukaryotic gene expression: Current understanding and future challenges
1/10 ALL	I. Transcriptional control of gene expression: Life beyond the promoter <i><u>Research article:</u> Martens et al. 2005, "Regulation of an intergenic transcript controls adjacent gene transcription in <i>Saccharomyces cerevisiae</i>."</i> <i><u>Background article:</u> Martens et al. 2004, "Intergenic transcription is required to repress the <i>Saccharomyces cerevisiae</i> SER3 gene."</i> <i><u>Review article:</u> Morey and Avner 2004, "Employment opportunities for non-coding RNAs."</i> <i><u>Review articles:</u> Kapranov et al. 2007 "Genome-wide transcription and the implications for genomic organization."</i>
1/17	MLK, Jr. Day
1/24 GRP1	II. Noncoding RNAs regulate transcription <i><u>Research article:</u> Camblong et al. 2007, "Antisense RNA Stabilization induces transcriptional gene silencing via histone deacetylation in <i>S. cerevisiae</i>"</i> <i><u>Preview article:</u> Proudfoot and Gullerova 2007, "Gene silencing CUTs both ways."</i> <i><u>Review articles:</u> See above</i>
2/1 GRP2	III. Noncoding RNA, post-transcriptional regulation, and human disease <i><u>Research article:</u> Faghihi et al. 2008 "Expression of a noncoding RNA is elevated in Alzheimer's disease and drives rapid feed-forward regulation of beta-secretase"</i> <i><u>Review article:</u> Goedert and Spillantini 2006, "A century of Alzheimer's disease."</i>

2/7 GRP3 IV. Alternative splicing and the regulated control of gene expression

Research article: Demir & Dickson 2005, "fruitless splicing specifies male courtship behavior in *Drosophila*"

(Also of interest: Stockinger et al. 2005, "Neural circuitry that governs *Drosophila* male courtship behavior")

(Also of interest: Vrontou et al. 2006, "fruitless regulates aggression and dominance in *Drosophila*")

Preview article: Dulac 2005. Preview: "Sex and the single splice"

Review article: Salvemini et al. 2010 "fruitless alternative splicing and sex behaviour in insects: an ancient and unforgettable love story?"

Review article: Alternative splicing review TBA

2/14 **President's Day**

2/21 GRP 4 V. Coordinated gene expression reactions: Pre-mRNA splicing regulates telomerase function

Research article: Box et al. 2008 "Spliceosomal cleavage creates the 3' end of telomerase RNA

Preview article: News and Views Bonnal and Valcarcel 2008 "Spliceosome meets telomerase"

Review article: Wilusz and Spector 2010 "An unexpected ending noncanonical 3' end processing machineries."

Review article: Spliceosome mechanisms TBA

2/28 GRP5 VI. MicroRNAs: Big roles for a new class of tiny RNAs

Research article: Kadener et al. 2009 "A role for microRNAs in the *Drosophila* circadian clock."

Review article: Bartel 2009. "MicroRNAs: Target recognition and regulatory functions"

Review article: Singh et al. 2008 "MicroRNAs micro in size but macro in function"

Review article (*Drosophila* circadian clock review): Blau et al. 2009 "What is there left to learn about the *Drosophila* clock"

3/7 GRP6

VII. Viral encoded microRNAs and human disease

Research article: Demian Cazalla et al. 2010 Down-regulation of host microRNA by a Herpesvirus saimiri noncoding RNA

Review article: Grassmann & Jeang 2008 "The roles of microRNAs in mammalian virus infection"

Review articles: See above

3/18 (Friday)

FINAL 3-6 PM

Possible paper TBA

* Group sign-ups will take place on Monday January 10th in class.