HORT 550: Molecular Methods for Potential Crop Improvement
Spring 2016
Instructor: Patrick Krysan

Overview: This course provides a survey of the molecular methods that are used to effect crop improvement. As a prerequisite, students are expected to have a solid understanding of basic molecular biology, genetics, and biochemistry. We will explore in depth a number of the most important molecular tools that are currently being used by plant scientists to developed improved crop plants. In general, there will be lecture on Mondays, a student-led discussion of journal articles on Wednesdays, and a lab session on Thursdays.

Schedule:

Mondays	2:25 PM - 3:15 PM	Room 351 Moore Hall
Wednesdays	2:25 PM - 3:15 PM	Room 351 Moore Hall
Thursdays	1:20 PM - 3:15 PM	Room 128 Plant Sciences

Learning Objectives: Learn how to critically read scientific journal articles. Gain experience evaluating and discussing scientific results as reported in journal articles. Gain experience preparing and presenting a formal talk on a scientific topic. Develop an understanding of how discoveries in basic science lead to practical developments that drive crop improvement.

Develop a deep understanding of the following molecular methods: Genome Sequencing, RNAseq, Gene Expression Chips, Agrobacterium-mediated plant transformation, Gene Silencing, and CRISPR-CAS. Develop a working knowledge of the following bioinformatics tools: BLAST searching, EFP Browser, Genevestigator, DNA Subway, Co-Expression Analysis Tools, and Network Analysis Tools

Learn@UW Webpage. This course will make use of the Learn@UW system for course organization and providing course materials.

Grading: The following factors will determine a student's grade:

Participation in Discussion: 10%
Week writing assignments: 10%
Lab Notebook: 10%
Exam 1: 25%
Exam 2: 25%
Final Presentation: 20%

Exams: There will be two in-class exams (See course schedule for exam times). These will be closed-book exams. Exams will be returned to the instructor, who will make photocopies of each exam. Each student will receive their own exam back, ungraded, at the next class period. Students will be given one week to check over their exams and correct any mistakes that they feel they have made. Students can consult books, notes, and any other resource in order to correct their exams. Students can consult with each other during

this process, but must make a written note on their exam indicating with whom they discussed each answer that has been corrected.

The instructor will grade the original and revised versions of each student's exam. The initial version will count for 65% of the final grade for that exam and the corrected version will count for the remaining 35%.

Final Exam: There will not be a final exam. Students will use the final exam week to correct and return their second in-class exam, which will be given on the last day of class (Thursday, May 5).

Final Presentation: Students will give a 20 minute oral presentation summarizing an approved "Petition for Determination of Nonregulated Status" for one of the transgenic plants currently approved in the United States. These petitions are lengthy documents (from 70 to over 200 pages) that present the case for allowing a particular transgenic plant to be released for unregulated growth. They include detailed scientific descriptions of how the transgenic plant was created, what the purpose the transgene is, and other important details. Students will choose a specific Petition from a database of over 100 approved petitions. Additional details on the oral presentation will be provided in class.

Weekly Writing Assignments: Each week students will turn in a short 1 paragraph writing assignment using Learn@UW. The writing assignments will be based on the weekly reading assignments. The topic for each week's writing assignment will be posted on Learn@UW.

Weekly discussion sessions: Each Wednesday we will discuss a scientific paper that was assigned for that week. Each student must come to class fully prepared to lead the group discussion each week. The discussion of scientific papers typically focuses on the *Figures* presented in the paper. Students should carefully analyze each figure in the paper and write down relevant notes prior to class. These notes will be helpful when the student is called upon to lead the discussion of a given figure. Students will be randomly called upon to lead the discussion of a given figure. It is therefore critical that you come to class each week ready to lead the discussion. During each discussion session students will be graded on how well they have prepared for leading the discussion as well as on how well they contribute to the discussion when it is being led by others.

Laboratory Notebook: Students will keep an electronic lab notebook documenting the work that they do during the lab portion of the class. Details on how to use the electronic lab notebook will be provided in class.

HORT 550 Course Schedule

Mondays	2:25 - 3:15	LECTURE. Room 351 Moore Hall
Wednesdays	2:25 - 3:15	Literature Discussion. Room 351 Moore Hall
Thursdays	1:20 - 3:15	LAB. Room 128 Plant Sciences

			TOPIC
Week 1	Wed	**Jan. 20**	Course Overview & Illumina Seq Methods
	Thurs	**Jan. 21**	**Old school molecular methods roundup**
Week 2	Mon	**Jan. 25**	Next Gen Sequencing Methods II
	Wed	**Jan. 27**	**Discuss Readings**
	Thurs	**Jan. 28**	**LAB: BLAST SEARCHING and Electronic Notebooks**
Week 3	Mon	**Feb. 1**	Whole Genome Assembly and Annotation
	Wed	**Feb. 3**	**Discuss Readings**
	Thurs	**Feb. 4**	**GENOME BROWSER.**
Week 4	Mon	**Feb. 8**	Spatial and Temporal patterns of gene expression I
	Wed	**Feb. 10**	**Discuss Readings**
	Thurs	**Feb. 11**	**Genevestigator**
Week 5	Mon	**Feb. 15**	Spatial and Temporal patterns of gene expression II
	Wed	**Feb. 17**	**Discuss Readings**
	Thurs	**Feb. 18**	**RNA Seq Analysis with DNA Subway 1**
Week 6	Mon	**Feb. 22**	Agro Transformation 1
	Wed	**Feb. 24**	**Discuss Readings**
	Thurs	**Feb. 25**	**RNA Seq Analysis with DNA Subway 2**
Week 7	Mon	**Feb. 29**	Agro Transformation 2
	Wed	**Mar. 2**	**Discuss Readings**
	Thurs	**Mar. 3**	**EFP Browser**
Week 8	Mon	**Mar. 7**	Functional Genomics.
	Wed	**Mar. 9**	**Discuss Readings**
	Thurs.	**Mar. 10**	**Exam #1**
Week 9	Mon	**Mar. 14**	RNAi 1
	Wed	**Mar. 16**	**Discuss Readings**
	Thurs	**Mar. 17**	**Co-Expression Analysis Tools**
	Mon	**Mar. 21**	SPRING BREAK
	Wed	**Mar. 23**	SPRING BREAK
Week 10	Mon	**Mar. 28**	RNAi 2
	Wed	**Mar. 30**	**Discuss Readings**
	Thurs	**Mar. 31**	**Network Analysis Tools**

Week 11	Mon	**Apr. 4**	RNAi 3
	Wed	**Apr. 6**	**Discuss Readings**
	Thurs	**Apri. 7**	**QTL mapping 1**
Week 12	Mon	**Apr. 11**	CRISPR 1
	Wed	**Apr. 13**	**Discuss Readings**
	Thurs	**Apr. 14**	**QTL Mapping 2**
Week 13	Mon	**Apr. 18**	CRISPR 2
	Wed	**Apr. 20**	**Discuss Readings**
	Thurs	**Apr. 21**	**Student Oral Presentations 1**
Week 14	Mon	**Apr. 25**	CRISPR 3
	Wed	**Apr. 27**	**Discuss Readings**
	Thurs	**Apr. 28**	**Student Oral Presentations 2**
Week 15	Mon	**May 2**	CRISPR 4
	Wed	**May 4**	**Discuss Readings**
	Thurs	**May 5**	**Exam #2**