

BIOL 433 Plant Genetics
Term 2, 2019/2020

Instructors:

Dr. George Haughn
BioSciences 2239
(604) 822-9089
george.haughn@ubc.ca

Dr. Ljerka Kunst
BioSciences 2237
(604) 822-2351
ljerka.kunst@ubc.ca

Dr. Yuelin Zhang
BioSciences 2207
(604) 827-3794
yuelin.zhang@ubc.ca

Lectures: M,W,F 13:00-13:50
Room: 205 West Mall Swing Space

Tutorials: Tu 14:00-15:30
Room: 205 West Mall Swing Space

Website: <http://blogs.ubc.ca/biol433/>

Reading

- Papers and reviews to be downloaded from website.
- Westhoff et al. 1998. *Molecular Plant Development: From gene to plant*. Oxford University Press, Oxford. Selected parts available for purchase at the UBC Bookstore.
- Buchanan et al. 2000. *Biochemistry & Molecular Biology of Plants*. American Society of Plant Physiologists, Rockville MD. Useful for several topics; selected parts available for purchase at the UBC Bookstore.
- Book chapter on SA and SAR by Terry Delaney

Lecture outline:

A. Basic information and methods in plant genetics (8 lectures)

1. Plant genomes and genomics (Haughn)
2. Classical and molecular genetics: mutants; gene mapping, cloning and molecular analysis (Haughn, Kunst)
3. Reverse genetics (Zhang)
4. Gene transfer in plants (Kunst)

B. Topics in plant genetics (28 lectures)

1. Biochemistry and metabolism (Kunst; 8 lectures)
2. Development (Haughn; 9 lectures)
3. Plant-pathogen interactions (Zhang; 11 lectures)

Evaluation:

- 35% Final exam
- 30% Take-home problem assignments (3)
- 9% Tutorial assignments (9)
- 20% Tutorial presentation (group presentations of assigned papers, and an individual written report)
- 6% Class participation

The take-home assignments will be similar in format to final exam problems. You will be asked to solve a problem and/or evaluate data relevant to material discussed in lectures. There will be one assignment for each of the three lecture sections B1-3 (below). You may work together, and consult any source, but will hand in an individual assignment, which will be individually evaluated. The objectives of these assignments are to help you understand and use the information and experimental approaches presented in class, and to provide you with practice in answering the type of questions you will see on the final exam. See below for information on tutorial evaluation.

Tutorials

A paper will be assigned for each of 11 tutorials with the topics integrated into lecture material. If you do not have experience reading scientific literature you should read '[Tips for Reading a Paper](#)'. The assignments for individual tutorials will also help direct your attention to important points in each paper. All tutorials except for the first one will be student-led.

Date	Topic	Activity	
Jan.	7	No tutorial	
	14	Molecular analysis of plant genes	assignment class discussion
	21	No tutorial	
	28	Plant biochemistry/metabolism	“ “
Feb.	4	Plant biochemistry/metabolism	“ “
	11	Plant biochemistry/metabolism	“ “
	25	Plant development	“ “
March	3	Plant development	“ “
	10	Plant development	“ “
	17	Plant-pathogen interactions	“ “
	24	Plant- pathogen interactions	“ “
	31	Plant-pathogen interactions	“ “

Assignments:

A short assignment will be due at the beginning of each tutorial except for the tutorial you help present (for a total of 9% of the course mark). The objective of the assignments is to motivate you to read and think about the tutorial paper before it is discussed.

Group presentations:

You will be asked to sign up for one of 9 group presentations. Your group will design and deliver an oral presentation (in which all group members will participate) that defines the question addressed by the paper, summarizes the genetic methodology used to address the question, provides a critical analysis of the results of the reported experiments, summarizes the authors' (and your) interpretations of the results, and describes unanswered and/or newly raised questions. Each of your classmates will have read the paper, and the ideal presentation will engage the class in an interactive manner. **Students who present will need to meet with us the week before their presentation!**

You will be evaluated on the quality of your presentation as a group (5%) and individually (10% for oral presentation + 5% for your own written summary of the paper for a total of 20% of the course mark).

Accessing tutorial papers.

Tutorial papers will be made available on our web-site (<http://blogs.ubc.ca/biol433/>). The paper needed for our first tutorial is presently available, while the others will be posted the second week of classes. If you have difficulty downloading the papers, please let us know.

Tutorial #1 BIOL 433

Tues. January 14th, 2020

Please read the following paper. Try to answer the questions below as you read and after you read. We will discuss these in the tutorial.

Bhattacharyya et al, 1990. The wrinkled-seed character of pea described by Mendel is caused by a transposon-like insertion in a gene encoding starch-branching enzyme. Cell 60, 115-122.

Introduction section:

1. What was known about the *R* gene before the studies in this paper were undertaken?
2. What is the phenotype of *r* (rugosus) mutant plants? Why is this an easy phenotype to study genetically?
3. How is the *r* phenotype inherited?
4. What are possible biochemical defects leading to the *r* phenotype?
5. What is SBEI and why was it felt that this enzyme might be defective in *r* plants?

Results

6. What methods were used to confirm that SBEI is defective in *r* plants?
7. How was the SBEI gene cloned? Why was it cloned?
8. What techniques were used to analyze an SBEI cDNA? What did these analyses demonstrate?
9. Is there genetic linkage between SBEI gene and *r* ? How was this demonstrated? Why was it important to demonstrate this?
10. Can you think of any other ways which, in theory, could be used to demonstrate that a defect in the SBEI gene causes the wrinkled phenotype?
11. What is the molecular basis for the *r* mutation? What methods were used to demonstrate this, and how do the results show this?
12. What alternative strategy **could** have been used to clone the *R* gene if the molecular basis of the mutation had been known beforehand?

Discussion

13. What is the significance of the results reported in the paper?
14. What do we know now that wasn't known before? What questions have been answered? Have any new questions been raised?

Lecture dates

A. Basic information and methods in plant genetics (8 lectures)

1. Plant genomes and genomics (Haughn) **Jan. 6**
2. Classical and molecular genetics: mutants; positional cloning; molecular analysis (Haughn; Kunst) **Jan. 8, 10, 13, 15**
3. Reverse genetics (Zhang) **Jan. 17, 20**
4. Gene transfer in plants (Kunst) **Jan. 22**

B. Topics in plant genetics (28 lectures)

1. Biochemistry and metabolism (Kunst; 8 lectures) **Jan. 24, 27, 29, 31, Feb. 3, 5, 7, 10**
2. Development (Haughn; 9 lectures) **Feb. 12, 14, 24, 26, 28, March 2, 4, 6, 9**
3. Plant-pathogen interactions (Zhang; 11 lectures) **March 11, 13, 16, 18, 20, 23, 25, 27, 30, Apr. 1, 3**
4. Debate on GMO research **April 6, 8**