

**PLB/BMB/CSS 856: Plant Molecular and 'Omic Biology**  
**Syllabus - Fall 2019**

| <b>Instructors</b> | <b>Department/Academic Unit</b>                  | <b>Office</b> | <b>Phone</b> |
|--------------------|--|---------------|--------------|
| Robert Last*       | Biochemistry and Molecular Biology/Plant Biology | BCH 301       | 2-3278       |
| Hideki Takahashi*  | Biochemistry and Molecular Biology               | MPS 3280      | 5-1897       |
| Sheng Yang He      | Plant Biology/PRL                                |               |              |
| Peter Lundquist    | Biochemistry and Molecular Biology               |               |              |
| Chad Niederhuth    | Plant Biology                                    |               |              |

\*Contact Hideki Takahashi (htakaha@msu.edu) and Rob Last (lastr@msu.edu) with general questions.

**Brief Description of Course:**

The intention of the course is to provide a survey of plant molecular biology, molecular genetics, genomics and cell biology, emphasizing recent research advancement and technology development in these disciplinary areas.

**Prerequisite:**

College-level genetics course (equivalent to PLB/IBIO/ZOL 341) and an understanding of molecular biology and gene expression are *essential*. Please do not enroll in the course if you do not have this background. Please contact Hideki Takahashi (htakaha@msu.edu) and Rob Last (lastr@msu.edu) if you have any doubts about the suitability of your preparation.

**Credits:** 3-0

**Class Session:** 3:00-4:20 PM (includes 5-minute break)  
Room 247 Plant Biology Building

**Web Site:** <https://d2l.msu.edu>  
Use your MSU userID and password (case-sensitive) to log in.

**Format/Daily Preparation:**

Sessions of the class typically will consist of lectures by the faculty combined with a discussion of assigned readings. For each week, two to four key papers will be posted as pdf files at the D2L web site, by the previous Friday. *All of the assigned papers should be read prior to class.*

Ten times during the semester one paper will be designated for thorough understanding and in-depth discussion. These key articles will be the source of a brief in-class quiz (see the reading list associated with each lecture). Students should prepare by making sure that they can answer the following:

- What was the goal of the research, including the problem being addressed?
- Which figure(s) or table(s) presents the most critical data in the study? Why?
- What were the strengths and weaknesses of the paper?
- What would *you* do next?

The instructors will provide lecture notes by or soon after lecture time through D2L. These notes will provide copies of some of the figures and tables that may be mentioned from the articles other than the assigned reading materials.

### Course Grade:

The grade is based on two exams (60% of grade total; split between the midterm and the final according to the number of class periods devoted to each) and a research proposal (30% of grade total). The remaining 10% of the final grade is based on the out-of-class assignments, in-class quizzes (lowest grade eliminated from grading), involvement in discussion of the assigned articles and general class participation.

### Exams:

The midterm and final exams will be made available to students through D2L at the end of the class period indicated on the schedule.

|                     | Available on D2L    | Due                 | Instructor |
|---------------------|---------------------|---------------------|------------|
| <b>Midterm Exam</b> | October 17, 8:00 AM | October 18, 5:00 PM | Last       |
| <b>Final Exam</b>   | December 5, 5:00 PM | December 6, 5:00 PM | Takahashi  |

*(Midterm Exam covering all material through the end of the lecture on October 10<sup>th</sup>; Final Exam covering the remaining lectures).*

- The two exams will have an open-book, take-home format: notes, books, articles, and online information may be consulted, but students are expected to complete their exams independently, without discussion with others until after all exams are turned in.
- Hard copy of the mid-term exam should be given to Rob Last in BMB 301a or left in his personal mailbox on the second floor of the Biochemistry Building (not in the lab group mailbox, please).
- The final exam should be submitted by email to Hideki Takahashi (htakaha@msu.edu).

### Research Proposal:

Your assignment is to write an original research project proposal on a specific topic in plant molecular biology/molecular genetics and genomics.

- **The proposal should include the molecular genetics and genomics aspects of the problems you choose to address** (as opposed to being focused only on the biochemistry, quantitative genetics, molecular breeding or physiology aspects of the problem). It should be related to a topic pertinent to the course. However, it does not have to be on a topic specifically covered in class.
- You should focus on a basic biology problem, though you may extend it with a perspective on translational possibilities. For instance, you could write a proposal in relation to mechanisms of plant disease resistance; molecular genetics of plant development; molecular and physiological responses to the environment (e.g., light, temperature, water, UV); etc.
- The proposal should NOT be directly related to the research project you are conducting for your graduate degree, are likely to perform as a student, or were involved in the past. For instance, if you would happen to be working on regulation of gene expression in response to low temperature, you should not write a proposal on that same or similar topic. You could, however, write a proposal on ABA-regulated gene expression and signaling or, of course, any of the other topics.
- The proposal should be original and creative. Students may not use a paper written for another course, nor conceptualized by someone else.
- You are strongly encouraged to start researching your topic as soon as the course begins, including discussions with Drs. Last and Takahashi before or after class times.
- Your proposal should be written using a 11-12 point standard 'with serif' font (Times New Roman 12 point is a good choice) and single line spacing, numbering all pages.

- The general format of the proposal should be as follows:
  - Summary with Specific Aims** (1 page max.). State the broad, long-term objectives of the proposed line of research and describe concisely and realistically what the specific research described in the proposal is intended to accomplish. Specific aims should be listed as a short list (typically only 3-4 total).
  - Background and Significance** (2 pages max.). Summarize what is known about the chosen area of research critically evaluating the existing knowledge and specifically identifying the gaps the project is intended to fill. State concisely the importance of the research and relate the specific aims to the broad, long-term objectives of the project. Please cite key references in this and the next section, preferably in a “first author, date” style.
  - Experimental Design and Methods** (4 pages max.). Outline the experimental design and the procedures to be used to accomplish the specific aims of the project. Include discussion on how you will interpret the data. Discuss the potential difficulties and limitation of the proposed procedures and present alternative approaches to achieve the aims where appropriate. On a separate page (not included in the 4 page max count), give a tentative sequence or timetable for the investigation.
  - References.** List the literature cited in the text, including titles and full list of authors.
  - Graduate and Past Research Projects** (1 paragraph). Briefly summarize the research you are conducting for your graduate degree.
- Your proposal should be submitted in three phases:

|                  |  |
|------------------|--|
| <b>Phase I</b>   | Title, Summary and Specific Aims (1 page) are in class on <b>October 1<sup>st</sup></b> . You will choose a time to have detailed discussions about your choice of topic and your abstract with both instructors on October 7 <sup>th</sup> or 8 <sup>th</sup> . |
| <b>Phase II</b>  | Background and Significance (2 pages) due in class on <b>October 29<sup>th</sup></b> .   |
| <b>Phase III</b> | Final full proposal due in class on <b>November 19<sup>th</sup></b> .  |

***Two hard copies should be submitted in class at each phase.***

### **Oral Presentations:**

Class periods (currently planned on December 3<sup>rd</sup> and 5<sup>th</sup>) are reserved for students to give 10-minute presentations describing their research proposals to the rest of the class. The order of the presentations will be randomly selected and announced only one day prior to the first session; thus all students should be prepared to speak on December 3<sup>rd</sup>. Electronic slides should be used to aid the presentations. The quality of both the oral presentation and the written report will be considered in assigning a grade to the research proposal. We recommend no more than 10 slides for a 10’ talk.

### **Other Recommended Activities:**

Throughout the semester, several seminar series will be hosting scientists who will present lectures on pertinent topics. Some may be mentioned in class, and posted on the D2L site or provided by email. We encourage you to mention seminars in class so that other students may learn of them. We encourage BMB students in the Molecular Plant Sciences (MPS) Program to attend several lectures in BMB 801 “Molecular Biology” to obtain more information on topics in molecular genetics and genomics that are not covered in PLB/BMB/CSS 856. Please contact BMB 801 course instructors David Arnosti (arnosti@msu.edu) and Bill Henry (henryrw@msu.edu) for details or advice.

**Course Assessment:**

*Michigan State University and the instructors take seriously the opinion of students in the evaluation of the effectiveness of instruction, and MSU has implemented the SIRS (Student Instructional Rating System) process to gather student feedback. This course utilizes the “online SIRS” system. You will receive an e-mail sometime during the last two weeks of class asking you to fill out the SIRS online form at your convenience. Please note the final grade for this course will not be accessible on STUINFO during the week following the submission of grades for this course unless the SIRS online form has been filled out. You will have the option on the online SIRS form to decline to participate in the evaluation of the course— we hope, however, that you will be willing to give us your frank and constructive feedback so that we may instruct students better in the future.*