

**Course: BMB 960 Sect 301 "Plant Biotechnology Research Forum"**

*Semester(s) offered: Fall*

*Credits: 1*

*Restrictions: Restricted to Biochemistry Graduate Students or Approval of the Instructor*

**Time:** Wednesdays – 1:00-2:30pm

**Room:** 1030 Molecular Plant Sciences (MPS) building

*\*this is an in-person course, please communicate with the course coordinator if you will need to connect remotely for one or more class periods\**

**Duration:** 12 class periods beginning on August 30<sup>th</sup>, 2023 – through Nov 15<sup>th</sup>

**Description:**

This is an advanced seminar focusing on primary scientific literature in the broad topic area of plant biotechnology. Student-led presentation and discussions related to selected materials are a major component of the course. The course is tightly integrated with an Annual Symposium (Plant Biotechnology for Health and Sustainability) that will next be held on May 20-21<sup>st</sup> of 2024 on MSU campus in East Lansing, MI. Students are expected to attend this Symposium (no registration cost) and a primary goal of the course is to enhance the value of student's participation in this event. For examples of past Symposium events, see: <https://plantmetabolism.natsci.msu.edu/events/past-symposia-agendas/index.aspx>.

Plant biotechnology is a broad topic area that can encompass many scientific fields and disciplines. Topic areas for classroom discussion are generally aligned with current research related to the use of photosynthetic organisms to address modern problems in human health and environmental sustainability. Topic areas in past years of this course have included: boosting lipid productivity in oleaginous microalga; synthetic biology and microbial biosynthesis from industrial Perspective; plant abiotic stress tolerance as agronomic trait and its quantification; electronically controlled microorganisms; the organization, function and evolution of plant metabolism, and; synthetic biology as it relates to food/oxygen production in future of long-range space exploration.

Each year, students who are participating in a NIH T32 graduate training program in plant biotechnology 'Plants for Health and Sustainability' (<https://plantmetabolism.natsci.msu.edu/>) discuss and select the topic areas that will be the focus of both BMB 960-301 and the accompanying Symposium. These topic areas are used to invite speakers with relevant expertise and to select current research articles in related fields. Speakers for the associated Annual Symposium are representatives not only from academia, but also from industry, government agencies, NGOs, not-for profit research, outreach organizations, national labs, and scientific policy groups. The primary goals of BMB 960-301 are to improve the breadth of knowledge of students working in plant-related fields, increase critical thinking skills through evaluation of the scientific literature, improve oral scientific communication skillsets, and to enable students to be able to fully engage with the affiliated Symposium.

**Format:** During most class periods, 1-2 students will deliver ~25 presentations and lead the class members through detailed discussion based upon the assigned topics. The topics and papers will be selected based upon the topics contributed by PBHS students (see above), and relevant for the

background of Symposium speakers. Therefore, topics vary each year. A single paper will be assigned for each student to present on the topic area, although students are encouraged to broaden the discussion beyond the boundaries of the paper itself - please feel free to include other papers, book chapters or online resources in your reading and for the preparation of the presentation. Active questions and discussion of the material is encouraged during the presentation period.

Suggested format for student presentations is: 5' of introduction, suitable for students familiar with molecular techniques but approachable for students with a variety of backgrounds. 15' of discussion of key experiments of the selected article, making sure to highlight both basic biological insight and applications when appropriate. 5' of conclusions including ideas for future experimental and engineering approaches, insights and ideas for your research that the work gave you or anything else that might be of interest to the class members. Approximately 15' of additional discussion with the class are budgeted for each class period.

The course will meet once each week for 12 weeks.

*Topic areas for the Fall 2023 BMB 960-301 course and May 2024 Symposium are:*

1. Mining Pan-genomic plant datasets for discovery of novel metabolic and signaling pathways
2. Synthetic Biology platforms and enabling technologies for engineering plants and photosynthetic microbes
3. Chloroplast biogenesis and protein import
4. Emerging trends and best practices for using generative AI in scientific discovery and communication
5. The changing governance on GMOs and the impact of these regulation on development of plant biotechnologies

**Grading:** Grades are based upon class participation (30%) and the research presentation (70%). Course materials will be made available to enrolled students at [D2L.msu.edu](https://D2L.msu.edu).

**Requirements/Restrictions:** If you are not a declared Biochemistry graduate student, you will need to submit the online override request form (<http://bmb.natsci.msu.edu/undergraduate/override-request-special-permissions-form/>) and then contact the course coordinator (Danny Ducat; [ducatdan@msu.edu](mailto:ducatdan@msu.edu)) for permission to enroll. Enrollment will be limited to 14 students.

**Course Philosophy/Structure:** A core value of this course and the affiliated PBHS Training Program is to continuously reiterate activities based on the changing needs and interests of emerging young scientists in the area of plant biotechnology. As such, this course can best serve the students if there is an invested interest and feedback cycle from students to the administrators (e.g., Course Coordinator, Danny Ducat). Each semester, the last class period will be reserved for a discussion and evaluation of the course and the associated Symposium. We expect that each student will actively participate in the symposium.

A tentative schedule of presentations and topic areas follow. Students will self-assign to specific topic areas at the start of the course and will present the relevant scientific article or other publication:

<u>Date</u>	<u>Topic</u>	<u>Presenter</u>
8/30/2023	Course Overview, Expectations, and Organizational Discussion	Danny Ducat
9/6/2023	RCR: Practices for the use of Generative AI in scientific writing	Danny Ducat
9/13/2023	Synthetic biology platforms for engineering photosynthetic microbes	TBD - Student led
9/20/2023	Chloroplast biogenesis and protein import	TBD - Student led
9/27/2023	Mining pan-genomic data for the discovery of novel biosynthetic pathway components	TBD - Student led
10/4/2023	Governance on GMOs - impact on scientific projects/progress	TBD - Student led
10/11/2023	Synthetic biology platforms for engineering plants	TBD - Student led
10/18/2023	Engineering plant chloroplasts and/or minimal genome development	TBD - Student led
10/25/2023	Engineering novel compartments in plants for bioproduction applications	TBD - Student led
11/1/2023	Fundamental insights in plant resilience from pan-genomic diversity	TBD - Student led
11/9/2023	(open session TBA)	TBD - Student led
11/16/2023	Wrap-up, feedback session, and discussion of May Symposium	Danny Ducat