



Plant Biology Major Requirements (effective Winter 2019)

Program in Biology Student Services

📍: 1140 Undergrad. Science Bldg. (USB)

🌐: <http://www.lsa.umich.edu/biology>

✉: lsa-biology-advising@umich.edu

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Why study Biology?

Biology as a discipline is connected to many aspects of our everyday lives. From development and disease, to the food we eat, to the environment around us, studying biology brings us a deeper understanding of the world around us and allows us to benefit society through medicine, agriculture and environmental stewardship. Biology is a rapidly advancing area as we learn more every day about biological concepts ranging from our cells to our planet. Mastering biology opens up diverse careers in health science (medicine, dentistry, public health), biotechnology and pharmaceutical sciences, biological research, environmental policy, conservation and wildlife biology, ecological monitoring, and farming.

Who should major in Plant Biology?

The Plant Biology major provides undergraduates with training in those areas of science that are essential to an understanding of modern plant sciences. Like the Biology major, Plant Biology deals with all of the major levels of biological organization (molecular, cellular, organismal, ecological, and evolutionary), but differs from the Biology major by its greater emphasis on the biology of plants. This program is well-suited for those who wish to study biology as part of a liberal education or to prepare for a teaching career in secondary schools. It also provides excellent preparation for graduate study in basic and applied areas of the plant sciences and related fields, such as ecology, genetics, microbiology, and biochemistry. Students intending to go to medical school should compare degree requirements to the med school requirements found here: <https://lsa.umich.edu/advising/plan-your-path/pre-health>. It is strongly recommended that pre-med and other pre-health students meet with an LSA pre-health advisor.

Exclusions: Students who elect a major in Plant Biology may not elect the following majors: Biology; Biology, Health, and Society; General Biology; Cellular and Molecular Biology (CMB); CMB:BME; Cellular & Molecular Biomedical Science (CMBS); Ecology and Evolutionary Biology; Ecology, Evolution, and Biodiversity; Microbiology; Molecular, Cellular, and Developmental Biology (MCDB); or Neuroscience. They also may not elect an academic minor in Biology; Ecology and Evolutionary Biology; Plant Biology; Chemistry; or Biochemistry.

How do I declare?

Students interested in any major in the biological sciences are encouraged to meet with an advisor to discuss their academic plans as soon as possible! Students need not have completed all of the major prerequisites to declare, but should have completed the introductory biology sequence with a 2.0 or better and be in good academic standing. Make an advising appointment online through the Biology website: www.lsa.umich.edu/biology.

What courses should I take first?

The introductory biology sequence consists of: BIOLOGY 171, BIOLOGY 172 or 174, and BIOLOGY 173. Students should take 171 or 172/174 first and then follow with the second lecture course and 173. **(Note that the introductory biology sequence courses cannot be taken pass/fail.)**

- Students with an appropriate AP/IB score receive credit for BIOLOGY 195, which is the equivalent of BIOLOGY 171 & 172/174, but does NOT grant credit for 173.
- Transfer students who receive credit for BIOLOGY 191 should take BIOLOGY 192 and BIOLOGY 173 to complete the introductory biology sequence.

<p>BIOLOGY 171 ...focuses on ecology, biodiversity, and genetics and evolutionary processes. Students engage with biological hypotheses dealing with prominent current issues such as human evolutionary origins, emerging diseases, conservation biology, and global change.</p>	<p>BIOLOGY 172 or 174 (prerequisite: prior or concurrent credit for CHEM 130) ...focuses on how cells, organs, and organisms work. (174 covers the same material as 172 but is geared toward students who prefer a more problem-solving approach to understand biology, rather than a more traditional lecture-based course.)</p>
<p>BIOLOGY 173 (prerequisite = BIOLOGY 171, 172, 174, 191, or 195) ...is the accompanying lab component to the introductory sequence. The course provides an integrated introduction to experimental biology. Topics focus on biochemistry, molecular genetics, evolution, and ecology.</p>	

How do I get involved in research?

Independent research is a wonderful opportunity to take an active role in studying what you enjoy! Students participate in a lab, field, or modeling project in which they themselves have a say in the design, implementation, and interpretation of experiments. Please visit the Undergraduate Research web pages for the specific requirements for independent research and advice on how to choose a research area and mentor: <http://www.lsa.umich.edu/biology/studentresearch>.

- [Andrzej Wierzbicki](#) (MCDB): genetics, RNA, chromatin
- [Bill Currie](#) (SEAS): ecosystem, productivity, nutrient cycling, community, invasive species, modeling
- [Cora MacAlister](#) (MCDB): plant development, reproduction, post-translational protein modification
- David C. Michener (Matthaei/Nichols): evolution, domestication, cultural history
- [David H. Sherman](#) (Chem. & Micro.): natural products, metabolic pathways, pharmaceuticals, bioenergy
- [Erik Nielsen](#) (MCDB): cell biology, membrane trafficking, cellulose, plant cell wall
- [Inés Ibáñez](#) (SEAS): community ecology
- [Mark Hunter](#) (EEB): chemical ecology, plant-animal interactions
- [Selena Smith](#) (EARTH): paleobotany, paleontology, evolution, anatomy, systematics
- [Stephen Smith](#) (EEB): evolution, computational biology, genomics, phylogenomics
- Yin-Long Qiu (EEB): evolution, phylogeny, mitochondrial genome

What are the requirements for Honors?

The Program in Biology administers an Honors Program to train students to conduct independent research in the biological sciences. Participating in the honors program allows students to develop their research skills, deepen their understanding of the field, and form productive relationships with faculty and other students. The achievement is noted on the diploma and official transcript.

In addition to completing all the requirements for the major, an honors degree requires:

- (1) an overall **and** major GPA of at least 3.4,
- (2) participation in at least two terms of independent research, and
- (3) the completion of a significant piece of independent research that is
 - (a) reported in an honors thesis and
 - (b) presented in a public forum.

Note that undergraduate research students typically register for an independent research course (as appropriate for their major) during each term of research. Formal course registration is encouraged, but not required. For more information, including the Honors Program application, consult the [Program in Biology Honors Information page](#).

How do I find out about internships, study abroad, or summer programs?

Information about study abroad, faculty-led intercultural internships, faculty-led courses and field experiences, and Spring/Summer language study is available through the Center for Global and Intercultural Study (www.lsa.umich.edu/cgis). The Opportunity Hub (<https://lsa.umich.edu/opportunityhub>) also provides information on fellowships, internships and other student opportunities.

Can I transfer courses from another institution?

The Program in Biology will review classes taken at other institutions to determine equivalency to University of Michigan Biology courses. (**Note that 300- and 400-level courses will not be evaluated for equivalent credit.**) If an external class is determined to be equivalent to a U-M course, it can be posted to your transcript as the U-M Biology course (with a "T") when you successfully complete the course *and* the transfer steps listed on the Biology website: www.lsa.umich.edu/biology/transfercrredit. Approved equivalent courses may count toward major requirements, but transfer students are encouraged to meet with a major advisor to develop a major plan. **At least 20 of the 30 credits required for the Plant Biology major must be taken in-residence.**

[Note: You are welcome to request review of a course *before you take it*. You will need to provide a detailed syllabus, and must obtain one from the instructor in advance.]

How can I get involved with student organizations?

There are several student organizations pertinent to biology-related majors. More detailed information is available on the Program in Biology website: www.lsa.umich.edu/biology.

- **Biology Student Alliance (BSA):** a student org. open to all Program in Biology & Neuro. majors as well as pre-med or other science-oriented students interested in biology research and outreach, and in collaborating and socializing with other biology-interested students. Email bsa-eboard@umich.edu for more information.
- **Botany Undergrads Doing Stuff (BUDS):** an extremely informal group of people dedicated to botany. Contact Faculty Advisors Robyn Burnham or Laura Olsen if interested.
- **Michigan Ecology and Evolutionary Biology Society (MEEBS):** The Michigan Ecology and Evolutionary Biology Society (MEEBS) is an informal club designed to create a community for EEB-interested students from any major. Contact faculty advisor [Catherine Badgley](#) or check out the MEEBS [Facebook page](#) for more information.

ELECTIVE PLANT BIOLOGY COURSES: Two courses from the Elective Plant Biology Course list are required; one must be a lab [indicated by an asterisk (*) below].

EEB 300* Undergraduate Research (3 credit min./max.)
EEB 348* / ENVIRON 348 Forest Ecosystems (Su at UMBS)
EEB 372* General Ecology Laboratory
EEB 400* Advanced Research (3 credit min./max.)
EEB 401 Advanced Topics (applicable sections only)
EEB 420 Plant Evolution
EEB 436* Woody Plants
EEB 455* Ethnobotany (Sp at UMBS)
EEB 457* Algae in Freshwater Ecosystems (Su at UMBS in even years)
EEB 468* Biology of Fungi
EEB 472 Plant-Animal Interactions
EEB 489 Soil Ecology
EEB 491 Phylogenetic Methods and Theory

EEB 498 The Ecology of Agroecosystems
EEB 556* Field Botany of Northern Michigan (Su at UMBS)
MCDB 300* Undergraduate Research (3 credit min./max.)
MCDB 321 Plant Physiology
MCDB 400* Advanced Research (3 credit min./max.)
MCDB 401 Advanced Topics (applicable sections only)
MCDB 405 Molecular Basis of Development
MCDB 406 Modern Genetic Advances
MCDB 430 Plant Molecular Biology
MCDB 433 Plant Biochemistry
MCDB 462 Epigenetics
EARTH/ENVIRON 431 Terrestrial Biomes
EARTH 432* Plant Paleobiology
+ Certain grad level courses by request

- EEB/MCDB 300 or 400 (Independent Research), elected for a minimum of 3 credits in a single term and conducted in a plant biology research lab, may be used to fulfill the lab requirement. (3 credit max. applies; see CONSTRAINTS.)
- Any course used to fulfill this requirement cannot also be used as a Required Plant Biology Course; i.e., a course cannot “double-count.”

ADDITIONAL ELECTIVE COURSES:

- Choose additional Biology, EEB, or MCDB courses at the 200-level or above to reach 30 major credit hours.
 - BIOLOGY 200, BIOLOGY 241, BIOLOGY 299, EEB/MCDB 301, EEB/MCDB 302, EEB/MCDB 800, MCDB 412, MCDB 461, MCDB 600, and non-specific (departmental) transfer credit are EXCLUDED.
 - The fourth course not taken under “Required General Courses” may be used here.

INTEREST AREAS: Students interested in specific plant biology topics can elect options from any of the groups below:

Development and Physiology

Core courses: Genetics, Biochemistry, Evolution
MCDB 300* Undergraduate Research (3 credit min./max.)
MCDB 321 – Plant Physiology
MCDB 400* Advanced Research (3 credit min./max.)

MCDB 405 Molecular Basis of Development
MCDB 401 Advanced Topics (applicable sections only)
MCDB 430 Plant Molecular Biology
MCDB 433 Plant Biochemistry

Ecology

Core courses: Ecology, Evolution, [either Genetics or Biochem.]
Geographic Information Systems (one of: SEAS 531 - Intro to GIS, EARTH 480 / ENVIRON 403 - Introduction to GIS in the Earth Sciences, or ENVIRON 309 - GIS Explorations)
STATS 400-level & above
EEB 416 / MCDB 416 Introduction to Bioinformatics
EEB 408 Modeling for Ecology and Evolutionary Biology
EEB 472 Plant-Animal Interactions
EEB 556* Field Botany of Northern Michigan (Su at UMBS)
EEB 372* General Ecology Laboratory
EEB 436* Woody Plants

EEB 455* Ethnobotany (Sp at UMBS)
EEB 457* Algae in Freshwater Ecosystems (Su at UMBS in even years)
EARTH/ENVIRON 431 Terrestrial Biomes
EEB 348* / ENVIRON 348 Forest Ecosystems (Su at UMBS)
EEB 468* Biology of Fungi
EEB 498 The Ecology of Agroecosystems
EEB 476 / ENVIRON 476 / NRE 476 Ecosystem Ecology
EEB 485 Population and Community Ecology
EEB 489 / ENVIRON 430 / NRE 430 Soil Ecology
MCDB 321 Plant Physiology

Diversity & systematics

Core courses: Evolution, Genetics, Ecology
Geographic Information Systems (one of: SEAS 531 - Intro to GIS, EARTH 480 / ENVIRON 403 - Introduction to GIS in the Earth Sciences, or ENVIRON 309 GIS Explorations)
EEB 416 / MCDB 416 Introduction to Bioinformatics
EEB 408 Modeling for Ecology and Evolutionary Biology

EEB 391 Introduction to Evolution: Quantitative Approach
EARTH 432* Plant Paleobiology
EEB 468* Biology of Fungi
EEB 491 Phylogenetic Methods and Theory
EEB 457* Algae in Freshwater Ecosystems (Su at UMBS in even years)

*Courses with an asterisk are LAB courses

PLANT BIOLOGY MAJOR REQUIREMENTS

PLANT BIOLOGY PREREQUISITES:

Introductory Biology Sequence:

	TERM:	COURSE:	GRADE:
<input type="checkbox"/> Complete Sequence A, B or C: A: BIO 171, BIO 172 or 174, & BIO 173 B: BIO 195 (AP/IB) & BIO 173 C: BIO 191 (transfer credit), BIO 192, & BIO 173 <i>*Students may declare the major after completing the intro bio sequence with a C average*</i>			

Chemistry Sequence:

<input type="checkbox"/> CHEM 210 & CHEM 211			
<input type="checkbox"/> CHEM 215 & CHEM 216			

Quantitative Prerequisites:

<input type="checkbox"/> STATS 180, 250 or 280			
<input type="checkbox"/> 2 courses from the following options: <ul style="list-style-type: none"> • Calculus I: MATH 115, 120, 175, 185, or 295 (or equivalent) • Calculus II: MATH 116, 121, 156, 176, or 186 (or equivalent) • General Physics I: PHYSICS 125, 135, 139, 140, or 160 • General Physics II: PHYSICS 126, 235, 239, 240, or 260 • Elementary Programming: EECS 183 • Mathematics of Life: BIOLOGY 202 			

PLANT BIOLOGY MAJOR:

Required General Courses: Select at least three of the four courses listed.

<input type="checkbox"/> Ecology: BIO 281 or EEB 381			
<input type="checkbox"/> Genetics: BIO 305			
<input type="checkbox"/> Biochemistry: Choose from: MCDB 310, BIOLCHEM 415, or CHEM 351			
<input type="checkbox"/> Evolution: EEB 390, 391, or 392			

Required Plant Biology Courses:

(Any course used to fulfill this requirement cannot also be used as an Elective Plant Biology Course; i.e., a course cannot "double-count.")

<input type="checkbox"/> Plant Biology: BIO 230			
<input type="checkbox"/> BIOLOGY 255 (Plant Diversity), or EEB 420 (Plant Evolution), or EEB 436 (Woody Plants)			
<input type="checkbox"/> MCDB 321 (Plant Phys.), or MCDB 430 (Plant Molecular Bio.), or MCDB 433 (Plant Biochem.)			

Elective Plant Biology Courses:

(Any course used to fulfill this requirement cannot also be used as a Required Plant Biology Course; i.e., a course cannot "double-count.")

<input type="checkbox"/> Choose two courses from the Elective Plant Biology Course list (see attached); <u>at least one must be a lab</u> [indicated by an asterisk (*)]. <ul style="list-style-type: none"> • EEB/MCDB 300 or 400 (Independent Research), elected for a minimum of 3 credits in a single term and conducted in <u>a plant biology research lab</u>, may be used to fulfill the lab requirement. <i>(3 credit max. applies; see CONSTRAINTS below.)</i> 			
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Additional Courses:

<input type="checkbox"/> Choose additional Biology, EEB, or MCDB courses at the 200-level or above to reach 30 major credit hours. <ul style="list-style-type: none"> • BIOLOGY 200, BIOLOGY 241, BIOLOGY 299, EEB/MCDB 301, EEB/MCDB 302, EEB/MCDB 800, MCDB 412, MCDB 461, MCDB 600, and non-specific (departmental) transfer credit are EXCLUDED. • The fourth course not taken under "Required General Courses" may be used here. 			
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CONSTRAINTS:

<ul style="list-style-type: none"> • Prerequisites, introductory science courses, and non-specific (departmental) transfer courses are EXCLUDED from the 30 cr. required for the major. • <u>A maximum of 3 credits of independent research</u> (EEB/MCDB 300 or 400, et al.) may be counted toward the major. 			
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Total Credits and GPA Requirement for Plant Biology:

<input type="checkbox"/> Minimum 30 cr. in Major			
<input type="checkbox"/> Minimum 2.0 GPA in Major: GPA is calculated from all mandatory prerequisites, all courses used for major requirements (including cognates), and all courses in BIOLOGY, EEB, and MCDB.			