(what's this? it's a leaf!)

This microscope photo was taken by Phil Gates and read more about this beautiful section here: https://beyondthehumaneye.blogspot.com/2009/06/dune-builder.html?m=1

Interested in adding OEB 52???? We are happy to have more students in the class and will add lab sections at times when we can accommodate as many people's schedules as possible. Our current lab times are Tuesday 3-5pm, Wednesday 2:30-4:30pm, and Thursday 3-5pm.

You can indicate your lab section preference here: https://doodle.com/meeting/participate/id/dLAPM0We.

Feel free to reach out to one of us (Elena Kramer and Missy Holbrook) with any questions.

We are meeting on Tu-Th 9:00-10:15am in Biolabs 1080 (main Bio Labs lecture hall).

Welcome to OEB 52!

â€œBiology of Plantsâ€ explores the evolutionary history of a lineage of green algae that moved onto land and diversified to become â€œlandâ€ plants or just simply plants.

Our goal is to help you understand the diversity of plants: how they grow, reproduce, defend against predators and pathogens, and acquire the resources they need to photosynthesize. We want to cure you of â€œplant blindness,â€ to help you to see and understand the organisms that are the source of much of what we eat, wear, breath, and use.

Professors Kramer (Elena) and Holbrook (Missy) want to share our enthusiasm for plant biology. The best way we know how to do this is by making the class fun. Read our CUE ratings: this is a fun class.

What background do you need to do well in this class? Really, high school biology should be enough. If there is something you donâ€™t remember, meiosis for example, we will provide a refresher. We have had many non-majors and freshmen do well in OEB 52. Here is some information compiled from previous years about who has taken this class and how they fared in terms of grades. On the other hand, if you have already taken a lot of advanced biology classes, we are confident that you will not be bored. Plants are different. Even if you know a lot about animals, bacteria, fungi or molecular biology â€“ think of this class as akin to learning a new language. You will never regret learning to speak "plant."

Some nuts and bolts (note: more details can be found after the lecture schedule, this is just a summary of the course components):
Lectures: Missy and Elena will give lectures on Tuesdays and Thursdays at 9:00am in Bio Labs 1080. Lecture pdfs will be posted on the Lectures page ahead of the meeting time. We will make an effort to make basic Zoom recordings of the lectures for the use of students who may need to isolate during the semester, but these will not be a good substitute for attending lecture in person (see also in-class quizzes below!).
"In-class" quizzes: The in-class quizzes will be offered via Learning Catalytics (LC). Our main goal with these quizzes is to try to help you keep up with our lectures and the material in the class. The questions are designed to be relatively easy and straight-forward, and they will focus on major concepts from the lecture, primarily those highlighted on the Objectives slide. We will never ask you about something that is only mentioned in passing. It will be covered, in text, in the lecture pdf. We will drop your **ONE** lowest quiz grade. As a general rule, we don't offer make ups for these quizzes but if you have to miss lecture due to planned events such as athletics or interviews, contact Missy or Elena ahead of time. Obviously, if you become seriously ill and must miss multiple classes, contact your Resident Dean and have them get in touch with us.
Take-home Assignments: The take home assignments will be composed of three short essay questions worth 10 pts each for a total of 30 pts. Each answer should be no more than 350 words (and will likely be less). These questions will be more integrative and synthetic, covering the most recent material in the class. The first take home will be available on Tues. Feb. 6 and due two weeks later on Tues. Feb. 20, when the second take home will be available. This pattern will continue through the semester with the last assignment due Apr. 16, for a total of five assignments worth 150 points total. You all have the option to request ONE extension without cause (i.e., just tell us you need an extension and we will give it to you, no excuses necessary). Please let us know BEFORE the due date/time if you need an extension. That's not to say you can't have other extensions over the semester, it's just that you get one without having to jump through hoops, get doctor's notes, whatever.
Labs & Fieldtrips: Attendance in lab section is required. Lab sections are currently planned for Tuesday 3-5pm, Wednesday 2:30-4:30pm and Thursday 3-5pm. Additional sections may be added depending on enrollment. Lab is held in Biolabs 5088.

Final Exam: Our final will be in person during finals period (Tuesday May 7, time TBA), composed of multiple choice and short answer questions
Creative Project: We have a Creative Final Project that is a lot of fun. We will show some examples of this in one of the first classes - but if you have any questions or concerns, please get in touch with Missy and Elena. You can also make a time-lapse movie of a plant (trust us - they all move and many do interesting things).
More questions? Feel free to contact either of us by email: ekramer@oeb.harvard.edu and holbrook@oeb.harvard.edu.
Now take a break and watch these pretty flowers blooming.

And check out more cool plant cross-section images here: http://thetinyscienceblog.com/2014/07/31/the-beauty-of-cross-sections/.

Syllabus for OEB 52: BIOLOGY OF PLANTS

Elena Kramer and N. Michele (Missy) Holbrook

Note: The red â€œQâ€ indicates lectures in which in-class quizzes will be given.

The blue â€œTH DUEâ€ indicates dates when take-home assignments will be due.

Lecture Date			**Lab**	
Tues. Jan. 23	**1**	**Intro and â€œPlantsâ€ defined (EK)**		
Lab			**Lab 0**	**Greenhouse Visit**
Thurs. Jan. 25	**2**	**Growth in plants (EK)**		
Tues. Jan. 30	**3**	**Autotrophy (NMH)**		
Lab			**Lab 1**	**Plant Anatomy**
Thurs. Feb. 1	**4**	**Sexual reproduction (EK) Q**		
Tues. Feb. 6	**5**	**Green algae (NMH) Q**		
Lab			**Lab 2**	**Green Algae**
Thurs. Feb. 8	**6**	**Origin of land plants (NMH)**		
Tues. Feb. 13	**7**	**Vascular tissues and transport (NMH) Q**		
Lab			**Lab 3**	**Vascular Transport**
Thurs. Feb. 15	**8**	**Bryophytes (EK)**		

Tues. Feb. 20	**9**	**Lycopods (EK) TH DUE**		
Lab			**Lab 4**	**Bryophytes**
Thurs. Feb. 22	**10**	**Secondary growth (EK) Q**		
Tues. Feb. 27	**11**	**Ferns & allies (NMH)**		
Lab			**Lab 5**	**Ferns & Lycophytes**
Thurs. Feb. 29	**12**	**Origin of the seed (EK) Q**		
Mar. 1-2		**Weekend Field Trip to Harvard Forest**	**Lab 6**	**Tree growth and physiology**
Tues. Mar. 5	**13**	**Gymnosperms: Cycads (NMH) Q TH DUE**		
Lab				**No Lab Section**
Thurs. Mar. 7	**14**	**Gymnosperms: Conifers (EK)**		
Mar. 11-Mar. 15		**Spring recess**		
Tues. Mar. 19	**15**	**Angiosperms and flowers (EK)** **TH DUE**		
Lab			**Lab 7**	**Conifers**
Thurs. Mar. 21	**16**	**Monocots & Dicots (NMH) Q**		
Tues. Mar. 26	**17**	**Pattern Generation (EK)**		
Lab				**No Lab Section**
Thurs. Mar. 28	**18**	**Form and Function (NMH) Q**		
Sat. Mar. 30 1pm OR **Sun. Apr. 7 1pm**			**Lab 8**	**Field trip: Arnold Arboretum**
Tues. Apr. 2	**19**	**Fruits and seeds (EK) TH DUE**		

Lab			**Lab 9**	**Flowers**
Thurs. Apr. 4	**20**	**Symbiosis (NMH) Q**		
Tues. Apr. 9	**21**	**Environmental perception (EK)**		
Lab			**Lab 10**	**Fruits and Seeds**
Thurs. Apr. 11	**22**	**Biochemistry/defense (NMH) Q**		
Tues. Apr. 16	**23**	**Agriculture (NMH) TH DUE**		
Lab				**No lab section**
Thurs. Apr. 18	**24**	**Biotech and transgenics (EK) Q**		
Tues. Apr. 23	**25**	**Plant Creative Arts Festival**		
Sat. Apr. 27 1pm		**Optional Field Trip: Ponkapoag Bog**		
Mon Apr. 29 1pm		**Optional Fieldtrip: Garden in the Woods**		

Requirements:

- Participation in lectures, labs, and two fieldtrips
- Attendance of the Harvard Forest and Arnold Arboretum fieldtrips is **REQUIRED** (transportation will be provided for all fieldtrips)
- For the Harvard Forest fieldtrip, students are required to attend at least for the day on Saturday (8am-~6pm with some flexibility on the return time)
- If you are unable to attend the Harvard Forest fieldtrip, it can be made up by completing BOTH 1) a 5 page paper on plant growth and the activity of the vascular cambium, due on the last day of classes, and 2) lab activities at a time to be arranged.
- If you are unable to attend the Arboretum fieldtrip (note, there will be two options, either Saturday Mar. 30 OR Sunday Apr. 7), it can be made up by writing a 3 page paper on gymnosperm diversity, due on the last day of classes.
- Weekly in-class quizzes (see dates indicated above by the **Q**)
- Biweekly take home assignments (see due dates indicated above by the **TH DUE**)
- Lab participation & notebook (turned in at the end of the semester)
- Creative/film projects (more explanation in class, due on Monday April 22, noon)
- Final exam (3 hr final, day and time TBA)

Grading:

60% combined scores of in-class quizzes and take-home assignments

10% lab participation/ lab notebook

10% creative/media/film project

20% final exam

Each of the eleven in-class quizzes will be worth 10 pts and the ONE lowest score for each student will be dropped at the end of the semester. If you take every quiz, this will allow you to drop your weakest performance. If you miss a quiz, this will allow you to drop the 0 score. If you miss more than one quiz, that may impact your grade.

The take home assignments will be composed of three short essay questions worth 10 pts each for a total of 30 pts. Each answer should be no more than 350 words (and will likely be less). These questions will be more integrative and synthetic, covering the most recent material in the class. The first take home will be available on Tues. Feb. 6 and due two weeks later on Tues. Feb. 20, when the second take home will be available. This pattern will continue through the semester with the last assignment due Apr. 16, for a total of five assignments worth 150 points total.

Class Honor Code and Code of Conduct:

The OEB 52 teaching staff is committed to treating each student with respect and fostering a classroom environment that supports each student's ability to learn and contribute. In return, we ask that you treat your fellow students with respect and recognize that we all come to this topic with different backgrounds, interests, and experience. Plant biology is a topic that has real world importance and we will all learn from each other. We value teamwork and there will be opportunities within the class to work together.

For the take home assignments, we ask that you acknowledge and credit all of your sources, whether they be a published paper, wikipedia, a fellow classmate, or chatGPT (including what prompts you used). If we have concerns about whether your understanding matches the work you have submitted, we will transition the take-home assignment in question (and all future take-home assignments) to an oral format (i.e., we will ask you to answer the questions in-person). We also note that ChatGPT often misinterprets the meaning of scientific terms. If you provide a response that completely misinterprets the terminology used and you do not cite AI or other online source, we will ask you to re-answer the questions using an oral format.

We hope that you will be willing to challenge yourself and present work that represents your understanding of all the amazing things that plants do. Our goal is to help you gain this understanding and we look forward to this journey together.

Contact Information:

Elena M. Kramer, ekramer@oeb.harvard.edu. Office Hours: Monday at 11 via Zoom (through Canvas site). Youâ€™re also welcome to stop by my office and meet my dog Grace (to reward you for dragging up to the Biolabs).

N. Michele (Missy) Holbrook, holbrook@oeb.harvard.edu. Office Hours: 1 pm Tuesday (Bio Labs 3119) or via Zoom (through Canvas site). Let me know in advance if you want to zoom. If you come to my office, you may get to meet my dog Binka â€“ who is super friendly, furry, and fun.

Teaching Fellows:

Grace Pisano, gpisano@g.harvard.edu

Daniel Faccini, danielfaccini@fas.harvard.edu

Zhe He, zhehe@g.harvard.edu (Office Hours: Thursday 5-6pm, Biolabs 5088)

Readings/Reference:

There is no required textbook for this class. However, there are several books that you may want to look at as a reference. Note that we will not test you on material that is in any of these books, but not covered in class.

Raven, Evert and Eichorn. Biology of Plants, edition 7 or 8

The Botany of Desire: A Plantâ€™s-Eye View of the World, by Michael Pollan

Plant Life: A Brief History, by Frederick Essig

If you click on the "Library Reserves" tab on the left, you can get temporary e-access to Pollan and Essig but unfortunately, we are not allowed to offer free online access to Raven this year.

The Raven textbook is an excellent compliment to the lectures (see below) and Macmillan has a great offer on the e-book if you want your own copy, so check that out - https://store.macmillanlearning.com/us/product/Raven-Biology-of-Plants/p/1429219610.

All chapters reference Raven ed8

1	**Introduction and â€œPlantsâ€ defined**	Raven chapter 1 and 3 (2 and 4 for background/review) and chapters 23-25
2	**Growth in plants**	Raven chapters 22-25
3	**Autotrophy**	Raven chapter 7 (5 and 6 for background/review)
4	**Sexual reproduction**	Raven chapter 8
5	**Green algae**	Raven chapter 15, pp. 345-358
6	**Origin of land plants**	Raven Chapter 12
7	**Bryophytes**	Raven chapter 16
8	**Vascular transport**	Raven chapter 30
9	**Lycopods**	Raven chapter 17
10	**Secondary growth**	Raven chapter 26
11	**Ferns & allies**	Raven chapter 17
12	**Origin of the seed**	Raven chapter 18
13	**Gymnosperms: Cycads**	Raven chapter 18
14	**Gymnosperms: Conifers**	Raven chapter 18
15	**Angiosperms and flowers**	Raven chapters 19/20
16	**Angiosperm diversity**	Raven chapter 20/21
17	**Pattern Generation**	Raven chapters 25&27
18	**Form & Function**	Raven chapters 24&29

19	**Fruits and seeds**	Raven chapters 20
20	**Symbiosis**	Raven chapters 28/29
21	**Biochemistry/defense**	HLW chapter 31 (pdf will be available via canvas)
22	**Environment perception**	Raven chapter 28
23	**Agriculture**	Raven chapter 21
24	**Biotech**	Raven chapter 10