IB 181L

— Course Summary and Syllabus —

Paleobotany: The 500-million year history of a greening planet

This course serves as an introduction to the evolution of plants and terrestrial ecosystems through time. From the invasion of land to the present, we will follow the evolution of major plant groups through important moments of the Phanerozoic eon (the past 540 million years). By studying fossilized plant assemblages, we will interpret how major environmental changes unfolded across landscapes in the past and how plants have influenced the shaping of our planet. Lectures will be complemented by an interactive laboratory covering paleobotanical research techniques, study of fossil and living plant form and function in the lab and field, and analysis of peer-reviewed literature.

Format: Three hours lecture and three hours lab each week

Units: 4

Class Schedule

Lectures	Tues-Thurs: 9:30 - 11:00 am	2063 Valley Life Sciences Bldg.	Cindy Looy
Lab 101	Wed: 2:00 pm - 5:00 pm	3007 Valley Life Sciences Bldg.	Jaemin Lee
Lab 102	Fri: 9:00 am - 12:00 pm	3007 Valley Life Sciences Bldg.	Jaemin Lee

Contact

Instructor:	**Cindy Looy**
Instructor e-mail:	looy@berkeley.edu
Instructor office hours:	TBD

Text book

Kathy Willis and Jennifer McElwain, 2014. ***The Evolution of Plants***. Oxford University Press; 2nd Edition.

bCourses

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Class schedule

Dates		Lecture and lab topics
Jan 18	**Lecture 1**	Fossil plant preservation
Jan 20	**Lecture 2**	The paleobotanical toolbox
Jan 19/21	**Lab 1**	Read Hannah Bonner 2015 "A Cartoon prehistory of life on Earth"
Jan 25	**Lecture 3**	Earliest plant life
Jan 27	**Lecture 4**	The transition to land
Jan 26/28	**Lab 2**	Fossilization, preservation and transitioning to land
Feb 1	**Lecture 5**	Emerging terrestrial ecosystems
Feb 3	**Lecture 6**	A frozen ecosystem: the Early Devonian Rhynie Chert
Feb 2/Feb 4	**Lab 3**	Silurian-Devonian plants and their ecosystems
Feb 8	**Lecture 7**	Silurian and Devonian innovations - leaves and size
Feb 10	**Lecture 8**	Silurian and Devonian innovations - heterospory and seeds
Feb 9/11	**Lab 4**	Devonian innovations
Feb 15	**Lecture 9**	The Late Carboniferous coal swamps
Feb 17	**Lecture 10**	The Permian rise of gymnosperms
Feb 16/18	**Lab 5**	Coal ball peels demo with Diane Erwin and Ben Muddiman
Feb 22	**Lecture 11**	The end-Permian biotic crisis
Feb 24	**Lecture 12**	Early Triassic survival and recovery
Feb 23/25	**Lab 6**	Review session and Carboniferous plants
Mar 1	**No lecture**	**MIDTERM EXAM**
Mar 3	**Lecture 13**	Testing a proposed driver of the end-Permian crisis
Mar 2/4	**Lab 7**	Field trip botanical garden
Mar 8	**Lecture 14**	Mesozoic ecosystems
Mar 10	**Lecture 15**	Mesozoic seed plant relationships – guest appearance Fabiany Herrera
Mar 9/11	**Lab 8**	Gymnosperms diversification
Mar 15	**Lecture 16**	Flowering plant origins
Mar 17	**Lecture 17**	The rise of flowering plants
Mar 16/18	**Lab 9**	Gymnosperms and early angiosperms
Mar 21-25	**Spring break**	**Enjoy!**

Class schedule continued

Mar 29	**Lecture 18**	An angiosperm dominated rainforest - guest lecture Dori Contreras
Mar 31	**Lecture 19**	Mesozoic munching – guest lecture Jack Tseng
Mar 30/Apr 1	**Lab 10**	What's for dinner?
Apr 5	**Lecture 20**	The Cretaceous-Paleogene biotic crisis and its aftermath
Apr 7	**Lecture 21**	The PETM global warming event - guest lecture Ellen Currano
Apr 6/8	**Lab 11**	Plant-insect interaction
Apr 12	**Lecture 22**	The rise and demise of polar forests
Apr 14	**Lecture 23**	The Cenozoic cooling
Apr 13/15	**Lab 12**	Reconstructing paleoclimate Decide on presentation topic
Apr 19	**Lecture 24**	The Oligocene-Miocene rise of grasslands
Apr 21	**Lecture 25**	Quaternary ice ages
Apr 20/22	**Lab 13**	Ice age lab and opportunity for feedback on the presentations
Apr 26	**Lecture 26**	The Anthropocene: our impact on the vegetation and climate
Apr 28	**Lecture 27**	TBD
Apr 27/May 29	**Lab 14**	Lab symposium
May 2-6	**RRR week**	Review session, date and time TBA Extra credit assignments due
May 11	**Exam week**	**FINAL EXAM 11:30-2:30** location TBA

Labs

Lab structure

Labs in this course are designed to achieve five objectives:

1) Test your knowledge of the reading materials via quizzes.
2) Equip you with hands-on experience in observing and interpreting both fossil and living plants to complement lecture and reading materials.
3) Provide opportunities to work in teams and present your evaluations of a scientific paper and evaluate your peers' presentations.

Typical Lab itineraries

Friday lab	Wednesday lab	Activity
9:00-9:10 am	2:00-2:10 pm	Arrive and prepare for quiz
9:10-9:25 am	2:10-2:25 pm	Quiz
9:25-9:45 am	2:25-2 :45 pm	Lab introduction
9:45-11:30 am	2:45-4:30 pm	Lab exercise
11:30-12:00 noon	4:30-5:00 pm	Discuss lab exercise questions

Lab Components

1) Quizzes: During section a total of 10 quizzes will be given. These are merely meant to make sure you are on top of your reading assignments. These very short quizzes with several short-answer questions will cover the readings that are assigned for that week (see 'Schedule' below). Take good notes on key concepts and findings of your reading materials as you read. The quizzes are good practice for those on the midterm and final.

2) Lab exercises: Lab exercises provide a list of short-answer questions intended to delve into concepts discussed in lectures and readings. These exercises will be handed into the GSIs at the end of each lab and graded each week. Since these exercises will provide some of the content for the exams it is important that you ask questions to the GSIs during lab and/or office hours if any concepts are unclear.

3) Lab symposium: During the symposium students will couple up and give a presentation on a scientific paleobotanical paper or topic of their choice. Come and talk with Jaemin or Cindy for approval of your paper or topic at least two weeks before the symposium. If you have trouble deciding which paper to choose, we can help with that as well.

Audience duties — If you are not presenting, you have two tasks: Ask questions after the presentation; is there anything you don't understand? You will grade the presentation via a rubric you will receive in lab.

Lab readings and assignments

Jan 19/21 **Lab 1**

Read Bonner, 2015. When Fish Got Feet, When Bugs Were Big, & When Dinos Dawned: A cartoon prehistory of life on Earth (we will provide the book during the first lecture)

Jan 26/28 **Lab 2**

Quiz 1 Willis and McElwain, 2014. pp. 58–62, 64–66, 77–83:

- *– Formation of Soils,*
- *– Development of suitable climatic and atmospheric conditions,*
- *– Reduction of dependence on water for reproduction,*
- *– Protection against desiccation*
- *– 3.4: Evolutionary trends: green algae to land plants*

Feb 2/4 **Lab 3**

Quiz 2 Willis and McElwain, 2014. pp. 62–64, 66–71, 72–77, 83–89, 91:

- *– Modification of the life cycle*
- *– Development of specialized cells for water and nutrient uptake–3.3*
- *– 3.3 Examples of earliest land plants in the fossil record*
- *– Development of specialized cells for water and nutrient uptake*
- *– 3.5 Evolutionary trends in land plants: non-vascular to vascular–Summary*

Feb 9/11 **Lab 4**

Quiz 3 Willis and McElwain, 2014. pp. 98–113:

- *– 4.2 Major changes and innovations in the plant fossil record during the mid Devonian to end Carboniferous*
- *– 4.3 Evidence for further plant adaptations to land dwelling between mid Devonian and end Carboniferous (~394–299 Ma)*
- *– 4.4 Further adaptations to the plant life cycle*

Feb 16/18 **Lab 5**

Quiz 4 Willis and McElwain, 2014. pp. 146– 164

- *– 5.1 Environmental changes during the Permian (299–252 Ma)*
- *– 5.2 Evolution of cycads, bennettites, ginkgos, glossopterids, and gnetales*

Feb 23/25 **Lab 6**

Quiz 5 Willis and McElwain, 2014. pp. 287–296:

- *– 8.3 Why no mass extinction in the plant fossil record?*
- *– 8.4 Evidence for persistence in the plant fossil record*
- *– 8.5 Adaptations of plants for persistence through intervals of environmental change*

Mar 2/4 **Lab 7**

No quiz No readings

Lab readings and assignments continued

Mar 9/11 **Lab 8**

Quiz 6 Willis and McElwain, 2014. pp. 173-178, 214-224, 231-238, 246-250, 254-263

– 5.5 Biogeographical distribution of vegetation (201-182 Ma)
– 6.4 Evolutionary trends: gymnosperm to angiosperm
– 6.5 Biogeographical distribution of vegetation (~100-66 Ma)

Mar 16/18 **Lab 9**

Quiz 7 Willis and McElwain, 2014. pp. 196–216:

– 6.2 Nature and distribution of the earliest angiosperms
– 6.3 Why so late?

Mar 21-25 **SPRING BREAK**

Mar 30/Apr 1 **Lab 10**

Quiz 8 Willis and McElwain, 2014. pp. 192-196, 265-269, 279-288

– 6.1 small section: Leaves
– 8.1 Definition of mass extinction
– 8.2 Evidence in the geologic record: plants vs. animals
Cretaceous-Paleogene boundary

Apr 6/8 **Lab 11**

Quiz 9 Willis and McElwain, 2014. pp 225-231, 231-239, 288-297.

– 7.1 Environmental changes of the past 66 million years
– 7.2 Biogeographical distribution of global vegetation (~60-50 Ma)
– 8.5 Adaptations of plants for persistence through intervals of env. change

Apr 13/15 **Lab 12**

Quiz 10 *Willis and McElwain, 2014. pp 307-332.*

– 9.3 Mechanisms driving evolutionary change

Apr 20/22 **Lab 13**

No quiz Work on presentation

Apr 27/29 **Lab 14**

No Quiz Lab symposium

Course Policies

Grading: The class can be taken for a grade and as pass/no pass. A C- or higher is required to pass this class. See also: https://registrar.berkeley.edu/academic-records/grades The grades will NOT be curved. Written grade appeals are accepted in a time window starting three days after the initial grade has been assigned until ten days after. Before or after this period appeals will not be considered. Students who wish to review their exam should email the instructor. Be aware that re-grades can result in point deductions as well.

Grading Distribution:

One midterm (material from Part I):	**25%**
One final exam (material from Part II):	**40%**
Lab section performance (includes labs and presentation):	**25%**
Quizzes:	**10%**

Midterm and Final: Exams will be mostly short answer. The **Midterm** will cover topics in lecture, labs and readings during Part I of the course. The **Final** will cover topics in lecture, labs and readings during Part II of the course. The final is not technically "*cumulative*;" but will call upon foundational concepts from Part I necessary to understanding material in Part II.

Weekly Quizzes: Weekly quizzes cover the required reading material.

Attendance and class participation: Part of your course grade will be based on your participation during section. However, obviously, if you have a legitimate reason for being late or missing a section entirely, like a family emergency or illness, please contact your GSI Jaemin Lee as soon as possible at (jaeminlee0622@berkeley.edu). Generally, we will require written proof of the situation. Of course, non-emergency, non-pre-approved absence in sections will likely result in the point deduction.

Please attend the section that you actually signed up for, but if you need to change to the other section, please coordinate with Jaemin.

Classroom etiquette

Being prepared, attentive listening and completion of in-class work is important. Perhaps needless to say: be courteous and be on time, and most importantly: respect your fellow students and their opinions. We would like everyone to feel comfortable in our class. Please, no class-irrelevant laptop, tablet or cell phone use during class (points may be deducted for class participation).

Missed exams and missed or late assignments: You are expected to take all exams at their scheduled date and time. How we deal with missed exams and missed or late assignment will be decided on an individual basis by the instructor. If you know you are going to miss an exam, contact the instructor in advance. When you have missed and exam or assignment it is **up to you** to contact the instructor about this. We are always happy to help with scheduling conflicts and legitimate absence cases, but failure to bring it up can have consequences for your grade.

Reporting illness and family emergencies: If illness or a family emergency does prevent you from attending class, attending section or making an exam, let one of us know as soon as possible. We will require written proof of the situation. Don't forget we are always happy to help if we can, so please talk to us so we can take your hardship into account or provide simple accommodations to mitigate the situation.

Extra credit opportunities: One extra credit exercise will be offered in lecture, points TBD.

Statement on accommodation. Students who require accommodation for medical, religious or other reasons should contact the instructor before the start of the lecture series. We will be happy to accommodate students with disabilities. We do however require a letter from the Disabled Students' Program.

We would like everyone to get the most out of this course. If there is anything that prevents you from doing well in this class, please come and talk to us, so we can find out if there is something we can do to help.

Disclaimer. This syllabus is your handbook for the course. You are responsible for knowing and understanding all the information in it. Not knowing the requirements does not excuse you from fulfilling them. This syllabus may be subject to change. Please, check bCourses regularly for updates

UC Berkeley Honor Code

The student community at UC Berkeley has adopted the following Honor Code: "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others." The hope and expectation is that you will adhere to this code.

Collaboration and Independence: You will be working frequently groups this semester in both lecture and lab. In lab, you will be required to work in a group to present a discussion paper (you will evaluate and grade your peers' participation for these presentation projects). You will also be working in debate 'teams' for the two lab debates. In addition, partaking in study groups outside of class for the MIDTERM and FINAL is permitted and encouraged.

Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do with fellow students. This is recommended. However, unless otherwise instructed, homework assignments are to be completed independently and materials submitted as homework should be the result of one's own independent work.

Cheating: A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating. Anyone caught cheating on a quiz or exam in this course will receive a failing grade in the course and will also be reported to the University Center for Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.

Plagiarism: Failing to acknowledge work that is not your own is plagiarism and there are serious academic consequences for this. In the case of this course, any instance of plagiarism will result in an automatic zero on the respective assignment. If you use information or an idea in any activity relating to this course that is not your own, (i.e. *there is literature in existence that suggests you were not the first person on this planet to think of an idea*) you must cite or acknowledge the primary source of that idea or information. Likewise, if you are citing a classmate you must acknowledge your source.

There are exceptions such as common knowledge (e.g. *there are 24hrs in a day, the sky is blue*). Please also cite the sources for photos, figures, and tables that are not your own used in your

PowerPoints. If you need clarification regarding whether or not to cite a specific fact or information email the GSI or contact the Student Learning Center for assistance. For additional information on plagiarism and how to avoid it, see, for example:

http://www.lib.berkeley.edu/instruct/guides/citations.html#Plagiarism

http://gsi.berkeley.edu/teachingguide/misconduct/prevent-plag.html

Academic Integrity and Ethics: Cheating on exams and plagiarism are two common examples of dishonest, unethical behavior. Honesty and integrity are of great importance in all facets of life. They help to build a sense of self-confidence, and are key to building trust within relationships, whether personal or professional. There is no tolerance for dishonesty in the academic world, for it undermines what we are dedicated to doing – furthering knowledge for the benefit of humanity.

Your experience as a student at UC Berkeley is hopefully fueled by passion for learning and replete with fulfilling activities. And we also appreciate that being a student can be stressful. There may be times when there is temptation to engage in some kind of cheating in order to improve a grade or otherwise advance your career. This could be as blatant as having someone else sit for you in an exam or submitting a written assignment that has been copied from another source. And it could be as subtle as glancing at a fellow student's exam when you are unsure of an answer to a question and are looking for some confirmation. One might do any of these things and potentially not get caught. However, if you cheat, no matter how much you may have learned in this class, you have failed to learn perhaps the most important lesson of all.