BOTANY 4113 - Plant Evolution

Lecture: M, W, F, 9:30-10:20, Room: Virtual

Instructor: Dr. Jim Cohen
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Student hours: W 1-3 PM or by appointment

Course Objectives: The Plant Evolution course focuses on two broad areas: 1) the patterns of evolution of plants from prokaryotes to seed plants and 2) current patterns and processes of evolution among plants. The first area will involve an examination of the evolutionary patterns of plants, with a focus on land plants, and will include tracing patterns of evolution from prokaryotes to eukaryotes to land plants to vascular plants to seed plants. This section of the course will explore patterns, evolutionary innovations, and notable taxa throughout the history of plants. The second area will involve an investigation of the current patterns and processes influencing plant evolution. This includes variation within and among populations, strategies for reproduction and breeding systems in plants, patterns of selection, speciation, macroevolution, etc. We will discuss these aspects of plant evolution as well as delve into modern (and previous) methods for examining patterns and processes of evolution in plants.

According to Socrates, "Education is the kindling of a flame, not the filling of a vessel." By gathering and discussing botanical knowledge throughout this course, you will have the opportunity to stoke your intellectual flame. If you do so, your flame will burn brighter, and your ability to create, analyze, and synthesize information will grow. If not, the kindling will sit idle, not helping build the fire of your botanical intellect.

Student Learning Outcomes: Upon successful completion of this course, you will be able to:

- Summarize patterns and innovations of green plant evolution.
- Explain various processes that impact the evolutionary trajectory of plants.
- Conduct basic phylogenetic analyses.
- Explore plant diversity for the purposes of evolutionary studies, including basic statistical analyses.
- Understand species diversity and speciation within plants.

Text: *Evolutionary Biology: A Plant Perspective*, Mitchell B. Cruzan, 2018. Oxford University Press, ISBN: 9780190882679; *Plant Variation and Evolution, fourth edition*, David Briggs and S. Max Walters, 2016. Cambridge University Press, ISBN: 9781107602229; Additional readings may be provided

Grading:

Exam 1	100 points
Exam 2	100 points
Innovation discussion	25 points
Lightning talk	25 points
Phylogenetics project	50 points
Variation in plants project	50 points
Participation	50 points
Final Exam (Cumulative)	150 points
Total	**550 points**

Course Schedule

Date	Topic	Reading
Jan. 11	Introduction	
Jan. 13	Origin of life and eukaryotes 1	C – 3-21
Jan. 15	Origin of life and eukaryotes 2	C – 3-21
Jan. 18	No class – Martin Luther King Jr. Day	
Jan. 20	Colonization of land 1	C – 22-37
Jan. 22	Innovations – colonization of land and alternation of generations	
Jan. 25	Colonization of land 2 (V for asynchronous virtual class)	C – 22-37
Jan. 27	Innovations - vascular tissue and secondary growth	
Jan. 29	Colonization of land 3	C – 22-37
Feb. 1	Project design, hypotheses, and data exploration (V)	
Feb. 3	The first trees 1	C – 37-39
Feb. 5	Innovations – heterospory and leaves	
Feb. 8	The first trees 2 (V)	C – 37-39
Feb. 10	Multiple sequence alignment	
Feb. 12	Seed plants	C – 39-43
Feb. 15	No class – President's Day	
Feb. 17	Seed plants	C – 39-43, 45-52
Feb. 19	Innovations - seeds, pollen, and flowers	
Feb. 22	Phylogenetics and evolutionary methodology (V)	B & W – 336-354
Feb. 24	Guest lecture! – Dr. M. Alejandra Gandolfo-Nixon	
Feb. 26	Plant innovations discussion and review	
Mar. 1	Exam 1	
Mar. 3	Angiosperm origins 1	C – 45-52
Mar. 5	Alignment and Phylogenetics methods 1	B & W – 336-354
Mar. 8	No class – Spring Break	
Mar. 10	No class – Spring Break	
Mar. 12	No class – Spring Break	
Mar. 15	Angiosperm origins 2 (V)	C – 45-52
Mar. 17	Phylogenetics methods 2	B & W – 336-354
Mar. 19	Paleobotany lightning talks	
Mar. 22	Angiosperm diversification (V)	C – 52-56
Mar. 24	Mass extinctions	C – 43-45
Mar. 26	Patterns of plant evolution	
Mar. 29	Plant variation (V)	B & W – 135-160
Mar. 31	Phylogenetics project draft and discussion	
Apr. 2	Species concept presentations	
Apr. 5	Speciation (V)	B & W – 250-260
Apr. 7	Species concept discussion	
Apr. 9	Guest lecture! – Dr. Jacob Landis	
Apr. 12	Exam 2	
Apr. 14	Breeding systems	B & W – 98-134
Apr. 16	Let's talk Stebbins!	
Apr. 19	Hybridization and Polyploidy (V)	B & W – 260-322
Apr. 21	Phylogenetics presentations	
Apr. 23	Phylogenetics presentations	

The instructor reserves the right to make any changes necessary to the course and will inform the students as changes occur.

Class Behavior: Be respectful of your classmates, and do not disturb them by talking in class, arriving late, or participating in other disruptive behavior. Furthermore, you are not permitted in class to use cellular phones, pagers, two-ways, or other similar types of devices. If you use your cellular phone or other device in class, you may be asked to leave class due to the disruptive nature of your activity. Remember to act as you wish others would act.

Email Policy: I will respond to emails within 48 hours of receiving them, but only if the email includes all of the following: subject, salutation, body, and signature. Correct spelling and grammar are expected.

Make-up Exams and Late Assignments: Turning in assignments after the deadline or scheduling a make-up exam will not be possible unless you discuss the matter with the professor at least 24 hours before the assignment is due or the test is administered. Should there be extenuating circumstances (e.g., severe illness, funeral, accident), contact me as soon as possible in order to reschedule. Should you not follow these guidelines, you will receive a zero for the assignment or exam.

ADA accommodations: Any student requiring accommodations or services due to a disability must contact Disability Services (DS) in room 181 of the Student Services Center or Room 256 at the Davis Campus. Disability Services can also arrange to provide course materials (including this syllabus) in alternative formats upon request.

Academic integrity: The WSU Student Code defines plagiarism as 'the unacknowledged (uncited) use of any other person or group's ideas or work' (Section 6-22, part IV, subsection D, 2, b). Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, falsification, accessing unauthorized course or test information, using unauthorized resources, or breaches of copyright laws. None of these will be tolerated in this class. The penalty for academic dishonesty in this course is failure on the assignment and possibly the course, depending on circumstances.

Inclusive (virtual) classroom: Pivotal to Weber State University's mission is the need to embrace and value the diversity of its members. Acknowledging the uniqueness of each individual, we seek to cultivate an environment that encourages freedom of expression. Because the University is a community where inquiry is nurtured and theories are tested, every individual has the right to feel safe to express ideas that differ from those held by other members of the community. However, all persons who aspire to be part of our campus community must accept the responsibility to demonstrate civility and respect for the dignity of others. Recognizing that the proper balance between freedom of expression and respect for others is not always apparent or easy to achieve, we must continually challenge ourselves and each other in an atmosphere of mutual concern, good will and respect. Therefore, expressions or actions that disparage an individual's or group's ethnicity, gender, religion, sexual orientation, marital status, age or disability are contrary to the mission of Weber State University.

Core beliefs: According to the University's Policies and Procedures Manual (PPM 6-22 IV), students are to "[d]etermine before the last day to drop courses without penalty, when course requirements conflict with a student's core beliefs. If there is such a conflict, the student should consider dropping the class. A student who finds this solution impracticable may request a

resolution from the instructor. This policy does not oblige the instructor to grant the request, except in those cases when a denial would be arbitrary and capricious or illegal. This request must be made to the instructor in writing and the student must deliver a copy of the request to the office of the department head. The student's request must articulate the burden the requirement would place on the student's beliefs.

University closure: If for any reason the university is forced to close for an extended period of time, we will conduct our class via Canvas, e-mail, or whatever form of communication is most conducive to our class structure for each class.

Course Fees: There is no course fee associated with this class.

Covid-19 Revised Course Delivery Information: Our course this semester will include synchronous (meaning that we will meet together, online, at our regularly scheduled class time) online class sessions and asynchronous class material. You can enhance your success in these synchronous sessions by following the guidelines below:

1. Students will be required to use web conferencing software such as Zoom, Google Meet and Canvas Conferences for both office hours and synchronous class sessions. A webcam and mic are required to participate effectively in web conferencing sessions.
2. Access to video conferencing will be provided via a link in a course announcement. If you are new to Zoom, find easy set up and access information here.
3. Copy and paste the URL (or click on the web link) provided by your instructor at the time specified for the meeting. Launch the app (after initially downloading, installing, and logging in), and you will enter the meeting immediately.
4. You may choose to use your mobile device.
5. Please take note of the following:
    - Make every effort to be logged in to the class session 5 minutes early so we can start on time.
    - Mute your microphone at all times unless you are speaking.
    - When participating in a web conference, it is beneficial for our learning community to see you. Please have your camera on during the event. When presenting or speaking to the class during a web conference, students are highly encouraged to activate their webcam so others receive the full message, including non-verbals. *NOTE: If you are unable to or wish not to use the video feature, please contact me and we can discuss options.*
    - Demonstrate etiquette for online engagement (i.e. pause between speakers so as not to interrupt, use the hand-raising icon to speak, please dress as if you were coming to a face to face class).
    - If you need to take a break, please turn off your video and mute yourself. Do not take your device.
    - Be engaged! This should be an enjoyable experience.
6. I would like you to use a webcam in my class because I want to:
    - know who is in my Zoom lecture for security.
    - get to know my students, especially during these uncertain times.
    - do breakout rooms on Zoom and you need to know who is in your breakout group. I want you to feel comfortable.
    - go around to the breakout room and check in with you. By seeing your name and face, I can see your screen sharing and assess your engagement more effectively.

7. For your security, I request that you use your first name and last initial only on your Zoom profile.