Integrative Biology 51 **Summer 2021**
ORIGINS AND EVOLUTION OF FOOD PLANTS *3 Units*

This course may be used to satisfy the Biological Science breadth requirement in Letters and Science.

Instructor: Eric Harris (eric.harris@berkeley.edu)

Office Hours: Office hours will be available online (by Zoom) by appointment.

Lectures: Tu, Th 4:00 PM – 5:59 PM Online

Field trips: Field trips are mandatory when in-person instruction is possible. Virtual alternatives that involve student self-directed trips will be required in Summer 2021.

Course Description: The course will review major groups of food plants from an evolutionary and historical perspective, by examining the origins from wild relatives to current distribution and varieties today. Examples will be reviewed from a diversity of crops from around the world, such as grains, pulses, vegetables, fruits, nuts and others (e.g., caffeine-producing plants). General concepts covered will include plant morphology, evolutionary processes (domestication, hybridization, polyploidy, diversification) and relevant ecology (e.g., pollination biology, pest and pest control). Focus will include California agriculture and crops as illustrated through field trips, or virtual alternatives.

For Summer Session 2021, lectures will be provided live or pre-recorded modules for a total of 4 hours per week. In addition to lecture time, there will be weekly reading assignments, three self-directed field trips and one term paper over the course of the 8-week session. Learning will be assessed through regular quizzes, midterm, and a final exam.

Prerequisites: None. The course is designed for both majors and non-majors as an introduction to plant diversity, evolutionary, and ecological concepts to understand important food plants.

Reading Materials: Assigned reading materials will be posted on bCourses. There is no required textbook for the course.

Course Objectives: After successfully completing this course, you will be able to

- understand and describe evolutionary processes responsible for food plant diversity
- recognize the common and scientific names for common food plant species
- identify evolutionary relatives and geographic origins of food plant species
- describe parts of food plants using botanical terminology
- understand and describe crop needs (e.g., pollination, pest control) from an ecological and evolutionary perspective
- recognize main California crops and understand their cropping systems

Course Website: This course is built on a Learning Management System (LMS) called Canvas and UC Berkeley's version is bCourses (http://bcourses.berkeley.edu). You will need to meet these computer specifications to participate within this online platform. Class announcements, lecture outlines and/or slides, review sheets, assignments, and supplemental materials will be posted on this website.

If you are having technical difficulties please alert the course instructor immediately. However, understand that the instructor likely is not able to assist you with technical problems. You must call or email tech support and make sure you resolve any issues immediately.

In your course, click on the "Help" button on the bottom left of the global navigation menu. Be sure to document (save emails and transaction numbers) for all interactions with tech support. *Extensions and late submissions will not be accepted due to "technical difficulties."*

LEARNING ACTIVITES & GRADING

Reading Assignments: Each week includes assigned readings relevant to the topics covered. You can access all of the assigned readings via bCourses. Readings will be selected from a variety of sources, including examples from the popular literature (e.g., Diamond, 1999; Pollan, 2002), as well as the scientific literature. A core part of the course will include the review of food plant diversity according to plant families, and references/reading for that part of the course will also be supported by descriptions and vignettes for particular family or species (e.g., Bayton & Maughan's *Plant* Families; Smartt & Simmonds *Evolution of Crop Plants*; Van Wyk's *Food Plants of the World*, etc.).

Lectures: Each week you will find lectures that provide important information and insights on the week's topics. You are required to engage with all lecture materials and will be responsible for addressing the concepts in your course assignments.

Quizzes: Quizzes will be administered periodically during the course either during lecture or outside of lecture time on bCourses. Quizzes will typically be structured as a combination of multiple choice and short answer questions. Make-ups for quizzes will not be available.

Assignments: The course will include three self-directed field trips that require students to visit a local grocery store, botanical garden or park, and farm and relate back to the course material. Virtual alternatives to self-directed field trips may be arranged with permission of the instructor if there are factors preventing option of a self-direct field trip. A term paper will also be required that includes focusing on a food plant and reviewing the evolutionary origins and history of that plant. Further details on the assignments will be available on bCourses.

Midterm and Exam: One midterm and one exam will be administered online over the course of the term as indicated on the class schedule. Each will last for a period of two hours. The midterm and exam will be structured with similar types of questions as quizzes (i.e., combination of multiple choice and short answers). The midterm and exam will be administered once. In circumstances directly affecting you or your dependents *and subject to prior, written approval*, we will consider scheduling alternatives.

The final course grade will be calculated as follows:

Category	Percentage of Grade
Quizzes (x 4)	10%
Field trip assignments (x 3)	30%
Term paper	15%
Midterm	20%
Final Exam	25%

COURSE POLICIES

Promptness and Late Work Policy: All assignments have specific due dates listed in the course site and the Calendar on bCourses. You are expected to meet those listed due dates. If you anticipate that an extension may be needed, please contact the instructor immediately. Exceptions to the late work policy will be considered only in extenuating circumstances. All assignments will be submitted via bCourses. If an assignment is received after this time, it will be marked down 10%. If an assignment is received more than 24 hours after its due date, it will be accepted at our discretion and marked down 50%.

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 expectation is that you will adhere to this code. Read the entire Berkeley Honor Code for more information.

Collaboration and Independence: Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do with fellow students. This is recommended. However, all assignments are to be completed independently and should be the result of one's own independent work.

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.

- 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, midterm or final exam will receive a failing grade in the course and will also be reported to the

University Center for Student Conduct. The expectation is that you will be honest in the taking of quizzes, midterms, and exams.

- To copy text or ideas from another source without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. For additional information on plagiarism and how to avoid it, read the UC Berkeley Library Citation Page, Plagiarism Section. All work, including exams, quizzes, and written assignments, must be in your own words and not those of your classmates, the internet, or any material produced by someone else.

Incomplete Course Grade: Students who have substantially completed the course but for serious extenuating circumstances, are unable to complete assignments or exams may request an Incomplete grade. This request must be submitted in writing to the instructor. You must provide verifiable documentation for the seriousness of the extenuating circumstances. According to the policy of the university, Incomplete grades must be made up within the first three weeks of the next semester.

Students with Disabilities: If you require course accommodations due to a physical, emotional, or learning disability, contact UC Berkeley's Disabled Students' Program (DSP). Notify the instructor through course email of the accommodations you would like to use. You must have a Letter of Accommodation on file with UC Berkeley to have accommodations made in the course.

UC Berkeley is committed to providing robust educational experiences for all learners. With this goal in mind, we have activated the ALLY tool for this course. You will now be able to download content in a format that best fits your learning preference. PDF, HTML, EPUB, and MP3 are now available for most content items. For more information visit the alternative formats link or watch the video entitled, "Ally First Steps Guide."

COURSE OUTLINE

The weekly course schedule is provided in the following pages. All readings, lectures, and assignments are also provided in the week assigned in bCourses. The schedule is an approximate outline for the course. The schedule may change according to class needs or unforeseen circumstances. Notifications of any changes to the schedule will be announced in advance and posted on bCourses.

References: The list below provides relevant references for the course. Excerpts from references marked by an asterisk (*) are included in course readings.

*Bayton, Ross, and Simon Maughan. *Plant Families: A Guide for Gardeners and Botanists*. Chicago: The University of Chicago Press, 2017.

*Darwin, Charles, and Ernst Mayr. *On the Origin of Species*. 18. print., a Facs. of the first ed. Cambridge, Mass.: Harvard Univ. Press, 2003.

Denison, R. Ford. *Darwinian Agriculture: How Understanding Evolution Can Improve Agriculture*. Hardcover ed. Princeton, N.J: Princeton University Press, 2012.

*Diamond, Jared M. *Guns, Germs, and Steel: The Fates of Human Societies*. New York: Norton, 1999.

Hancock, James F. *Plant Evolution and the Origin of Crop Species*. 3rd ed. Wallingford, Oxfordshire, UK ; Cambridge, MA: CABI, 2012.

*Hsu, Elisabeth, and Stephen Harris, eds. *Plants, Health and Healing: On the Interface of Ethnobotany and Medical Anthropology*. Epistemologies of Healing, v. 6. New York: Berghahn Books, 2010.

Judd, Walter S. *Plant Systematics: A Phylogenetic Approach*. Fourth edition. Sunderland, MA: Sinauer Associates, Inc, 2016.

Motley, Timothy J., Nyree Zerega, and Hugh Cross, eds. *Darwin's Harvest: New Approaches to the Origins, Evolution, and Conservation of Crops*. New York: Columbia University Press, 2006.

*National Research Council (U.S.), ed. *Lost Crops of the Incas: Little-Known Plants of the Andes with Promise for Worldwide Cultivation*. Washington, D.C: National Academy Press, 1989.

*Pollan, Michael. *The Botany of Desire: A Plant's-Eye View of the World*. Paperback ed. Random House Trade Paperbacks. New York, NY: Random House, 2002.

*———. *The Omnivore's Dilemma: A Natural History of Four Meals*. New York: Penguin Press, 2006.

Simpson, Michael George. *Plant Systematics*. 3. edition. Amsterdam Heidelberg: Elsevier Academic Press, 2018.

Simpson, Beryl Brintnall, and Molly Conner-Ogorzaly. Plants in Our World: Economic Botany. 4th ed. New York, NY: McGraw-Hill Education, 2013.

Smartt, J., and N. W. Simmonds, eds. *Evolution of Crop Plants*. 2nd ed. Harlow: Longman Scientific & Technical, 1995.

Van Wyk, Ben-Erik. *Food Plants of the World: Identification, Culinary Uses and Nutritional Value*. Second edition. Wallingford, Oxfordshire, UK; Boston, MA: CABI, 2019.

Weinberg, Bennett Alan, and Bonnie K. Bealer. *The World of Caffeine: The Science and Culture of the World's Most Popular Drug*. New York: Routledge, 2001.

	Date	#	Topic	Reading	Assignments and Quizzes
Introduction and General Concepts	Tue Jun 22	1	Introduction to Food Plants	Darwin, C. 1859. *On the Origin of Species*. Introduction and Chapter 1, Pages 1 - 43.	
		2	Evolution I: Darwin and the Origin of Species		
	Thu Jun 24	3	Evolution II: Genetic Basis of Evolution		
		4	Evolution III: Evolutionary Change - Selection and Speciation		
	Tue Jun 29	5	What is a Plant? I: Evolution and Diversity	Diamond, J. 1999. *Guns, Germs and Steel*. Chapters 6, 7, and 8, Pages 100 - 150.	*QUIZ #1: Lectures 1-4*
		6	What is a Plant? II: Morphology		
	Thu Jul 01	7	What is a Plant? III: Names and Classification		
		8	Origins of Agriculture		
Food Plant Origins and Diversity	Tue Jul 06	9	Plant Domestication	Pollan, M. 2006. *Omnivore's Dilemma.* Chapters 1 and 2, Pages 15 - 56. Bayton/Maughan. 2017. *Plant Families*. Poaceae (p.96-99), Fabaceae (p.124-127).	*QUIZ #2: Lectures 5-8*
		10	Cereals (Poaceae)		
	Thu Jul 08	11	Cereals II		FT#1: Local Botanical Garden or Park assignment due Friday, July 9
		12	Legumes (Fabaceae)		
	Tue Jul 13	13	Fruits, Nuts and Berries: The Rose Family (Rosaceae)	Pollan, M. 2002. *The Botany of Desire.* Chapter 1, Pages 3 - 58. Bayton/Maughan. Rosaceae (p.130-133), Apiaceae (p.210-211), Brassicaceae (p.160-161).	*QUIZ #3: Lectures 9 - 12*
		14	Rose Family II		
	Thu Jul 15	15	The Carrot and Parsley Family (Apiaceae)		
		16	Variations on a Theme: The Mustard Family (Brassicaceae)		

	Date	#	Topic	Reading	Assignments and Quizzes
	Tue Jul 20	17	Melons, Squashes, and Gourds (Cucurbitaceae)	Bayton/Maughan. Cucurbitaceae (p.136-137), Solanaceae (p.186-187). National Research Council. 1989. *Lost Crops of the Incas.* Introduction, Pages 1-21.	
		18	Nightshades: A focus on South America (Solanaceae)		
	Thu Jul 22		*Midterm*		FT#2: Grocery store assignment due Friday, July 23
	Tue Jul 27	19	Bulbs (Amaryllidaceae)	Bayton/Maughan. Amaryillidaceae (p.84-85), Asteraceae (p.204-207), Betulaceae (p.138-139), Fagaceae (p.140-141), Juglandaceae (p.142-143), Rutaceae (p.152-153).	
		20	Lettuce, Artichokes and More: The Aster Family (Asteraceae)		
	Thu Jul 29	21	Nuts (Betulaceae, Fagaceae, Juglandaceae)		
		22	Citrus (Rutaceae)		
	Tue Aug 03	23	Tropical Fruits and Nuts (Anacardiaceae, Sapindaceae, Various)	Bayton/Maughan. Sapindaceae (p.150-151), Arecaceae (p.90-91), Bromeliaceae (p.94-95). Weckerle et al. 2012. *Medicinal, Stimulant and Ritual Plant Use: An Ethnobotany of Caffeine Containing Plants* in Hsu and Harris. Pages 262-295.	*QUIZ #4: Lectures 19-22*
		24	Tropical Monocots (Arecaceae, Bromeliaceae, Musaceae)		
	Thu Aug 05	25	Caffeine Producing Plants		FT#3: Local farm/garden visit assignment due Friday, August 6
		26	Plant Domestication in the US		
	Tue Aug 10	27	Before California Agriculture: Wild Harvest		
		28	California Agriculture		
	Thu Aug 12		*Final Exam*		Term Paper Due Friday, August 13