

BISC 121Lg
Advanced General Biology: Organismal Biology and Evolution
~ Fall Semester 2021 ~

Course Overview: BISC 121Lg is an advanced introductory course that will expose students to the breadth of biological diversity, evolution, and environmental biology. The course is designed to provide relatively even coverage of all major taxonomic groups, providing an evolution-based description of form and function, and an overview of ecology, behavior, population genetics, and conservation biology.

Lecturer: **David Hutchins, Ph.D.**, AHF 207, 213 740-5616, dahutch@usc.edu

Office Hours: Open door policy, or by appointment

Jed Fuhrman, Ph.D., AHF 211, 213 740-5757, fuhrman@usc.edu

Office Hours: 2-3 P.M. on Mondays, or by appointment

Lab Manager: **TBA**

Lab Instructors: **TBA**

Required Textbooks:

Lecture: [Campbell Biology](#), 12th edition

Website: <https://blackboard.usc.edu/> (for detailed class notes, announcements and grades—you will want to check this website regularly)

Grading: Final grades are assigned on a curve, determined entirely by the total number of points earned on lecture exams and in the laboratory. See the **Course Contract** posted on Bb for more details. After each exam a curve will be published to indicate roughly what letter grade corresponds to each student's current number of points. **Only the total number of points earned by the end of the course will determine the final grade.**

Exam Schedule:

Exam 1: Monday, Sept. 20 (10:00 – 10:50 AM)

Exam 2: Monday, Oct. 11 (10:00 – 10:50 AM)

Exam 3: Monday, Nov. 8 (10:00 – 10:50 AM)

Final Exam: Monday, Dec. 13 (8:00-10:00 AM)

For policies on re-grading and missed exams, refer to Course Contract available on the course website.

Students with Disabilities: Any student requesting academic accommodations based on a disability is required to register with the Office of Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Be sure that the letter is delivered to the laboratory director as early in the semester as possible, preferably by September 10, 2021. DSP is located in GFS 120 and is open 8:30-5:00, Monday through Friday. The telephone number for DSP is 213-740-0776.

Lecture schedule: MWF 10:00 - 10:50 AM

Date	Lecture Topic	Campbell Biology 9 th Ed.	Lecturer	Lecture Number
Aug 23	Introduction	Ch.14,15,16*	Hutchins	1
25	Darwinian Evolution: Concepts & Background	Ch. 22, 23	Hutchins	2
27	Evolution: The Modern Synthesis	Ch. 22	Hutchins	3
Aug 30	Micro/Macroeolution: Evolutionary Processes	Ch. 24	Hutchins	4
Sep 1	Microevolution	Ch. 24	Hutchins	5
3	<i>Macroevolution, the Species Concept, Speciation</i>	Ch. 25	Hutchins	6
Sep 6	<i>Labor Day</i>	-	-	<i>Holiday</i>
8	CRISPR Tech. & Applications (In-Class Disc.)	Ch. 26	Hutchins	7 (Discussion)
10	Phylogeny, Systematics, The Tree of Life	Ch. 26	Hutchins	8
Sep 13	Unicellular Eukaryotes: Protists II	Ch. 28	Hutchins	9
15	Unicellular Eukaryotes: Protists II	Ch. 28	Hutchins	10
17	Fungi Phylogeny and Ecology	Ch. 31	Hutchins	11
Sep 20	1st EXAM		Hutchins	Exam 1
22	Animal Diversity	Ch. 32	Hutchins	12
24	Invertebrates I	Ch. 33	Hutchins	13
Sep 27	Invertebrates II	Ch. 33	Hutchins	14
29	Invertebrates III	Ch. 33	Hutchins	15
Oct 1	DNA Barcoding		Hutchins	16 (Discussion)
Oct 4	Vertebrates: The Origin of Jaws	Ch. 34	Hutchins	17
6	Vertebrates: Amniotes	Ch. 34	Hutchins	18
8	Vertebrates: Primates & Hominid Evolution	Ch. 34	Hutchins	19
Oct 11	2ND EXAM		Hutchins	Exam 2
13	Origins of Life	Ch. 25	Fuhrman	20
15	FALL RECESS			
Oct 18	Virus Introduction	Ch. 19	Fuhrman	21
20	Viruses and Prokaryotic Genetics	Ch. 18.1, 27	Fuhrman	22
22	Prokaryote Structure & Function	Ch. 27	Fuhrman	23
Oct 25	Global Change Presentation or Microbiome Online Lecture		Fuhrman	24
27	Prokaryote Metabolic Diversity	Ch. 27	Fuhrman	25
29	Prokaryote Diversity and Ecology	Ch. 27	Fuhrman	26
Nov 1	The Evolution of Land Plants	Ch. 29	Fuhrman	27
3	Seed Plants	Ch. 30	Fuhrman	28
5	Elements of Plant Structure and Function	Ch. 35-39 (concepts only)	Fuhrman	29

Nov 8	3RD EXAM		Fuhrman	Exam 3
10	Behavioral Biology	Ch. 51	Fuhrman	30
12	Introduction to Ecology	Ch. 52	Fuhrman	31
Nov 15	Population Ecology	Ch. 53	Fuhrman	32
17	Community Ecology	Ch. 54	Fuhrman	33
19	Community Ecology	Ch. 54	Fuhrman	34
22	Ecosystems	Ch. 55	Fuhrman	35
24	Thanksgiving Holiday			<i>Holiday</i>
26	Thanksgiving Holiday			<i>Holiday</i>
Nov 29	Ecosystems	Ch. 55	Fuhrman	36
Dec 1	Conservation Biology	Ch. 56	Fuhrman	37
3	Conservation Biology	Ch. 56	Fuhrman	38
Dec 13	Final Exam 8:00 AM – 10:00 AM			Final Exam

NOTES: * Indicates chapters that students should read and/or review, especially if they have little or no prior familiarity with genetics. This syllabus may be subject to minor changes, which will be announced in class.

NOTES: Professors' lectures will be supplemented with PDF or PowerPoint documents posted for download on the class web site (<https://blackboard.usc.edu/>). The PDF files will generally be available a few days prior the respective lecture under *Course Documents*.

This syllabus may be subject to minor changes, which will be announced in class & posted on Blackboard. Again, it is YOUR RESPONSIBILITY to check the <https://blackboard.usc.edu/> website frequently.

ACADEMIC INTEGRITY is critically important. Familiarize yourself with USC academic integrity guidelines. See <http://www.usc.edu/student-affairs/SJACS/forms/tio.pdf>, and also The Undergraduate Guide for Avoiding Plagiarism at <http://www.usc.edu/student-affairs/SJACS/forms/tig.pdf>.

Please check your grades on Blackboard frequently (on your *My USC* home page click on *View Grades* in the *Tools* box); all corrections to grades must be completed PRIOR to the lecture final. Please notify your TA and the laboratory manager of the error and follow-up that it is corrected in a timely manner.

Please note your final exam schedule as soon as soon you can! You must have 3 or more documented final exams on the same day to warrant a final exam day change. If you have the required 3 finals on the same day, bring your documentation to the laboratory manager for approval in the beginning of the semester.

Please consult the Course Contract for further information on switching laboratories, exams, and how to handle class before the big game, holiday, etc.

BISC 121 LABORATORY SYLLABUS FALL 2021

Lab section 13192 (TUE/THU 11:00 – 12:25) will be taught by **Dr. Bancroft** and **Dr. Ghittoni**.

Phage Hunters is the first-semester component of the SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) discovery-based undergraduate research course. Students begin with simple digging in the soil to find new viruses, but progress through a variety of microbiology techniques to isolate, purify, and visualize their own phage particles. Finally, phage DNA will be isolated and sent to HHMI (Howard Hughes Medical Institute) for sequencing. Student can elect to continue their research by enrolling in the second semester of the course to perform complex genome annotation and bioinformatic analyses.

The program aims to increase undergraduate interest and retention in the biological sciences through immediate immersion in authentic, valuable, yet accessible research. By finding and naming their own bacteriophages, students develop a sense of project ownership and have a ready-made personal research project. For more information on the overall program, visit: www.seaphages.org or contact Dr. Christa Bancroft, cbancrof@usc.edu.

Lab sections 13193 and 13195 (WED 11:00 – 1:50, and WED 2:00 – 4:50) will be taught by a Teaching Assistant (TA), a graduate student from **Dr. Thrash's lab**.

Characterization of marine bacterioplankton

There are between 100,000 to 10 million microbial cells in every drop of seawater. These organisms naturally inhabit marine waters and very few are harmful to humans. Yet we know little about the functions of most of these microorganisms, and their abundances mean they are major players in global biogeochemical cycles. This Course-based Undergraduate Research Experience will involve BISC 121 students in performing basic research to help better understand previously uncharacterized marine microorganisms. The specific research tasks vary, but can include growth rate and respiration rate analyses, characterization of carbon utilization, and even basic genome analyses. Students will also learn to use the programming language R, practice reading primary literature in the field, and culminate their research with a poster presentation.

Lab sections 13191 and 13194 (TUE 2:00 – 4:50 and TUE 5:00 to 7:50) will be taught by a TA, a graduate student from **Dr. Nuzhdin's lab**.

Creating macroalgal collections for sustainability

Living collections of biological organisms are a cornerstone of basic science, education, and innovation infrastructure. We are creating macroalgal collections and evaluating them for seeding sustainable ocean. Algae present a promising pathway to address a continued food production challenge in the 21st century while also mitigating the worst impacts of climate change. This Course-based Undergraduate Research Experience will involve BISC 121 students in performing basic research to characterize genetically characterized kelps for their resistance to ocean pollutants and other stressors. The specific research tasks vary, but can include experimental manipulation of culturing, growth rate and photosynthesis rate analyses, and performing genomic analyses to infer genes responsible for kelp resilience. Students will also read primary literature in the field and culminate their research with writing a collective manuscript to be submitted in peer-review journal.