

BIOL S106 01 (SB24): Genes, Ecology, and Evolutionary Biology

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 Edit

BIOL S106

Note: BIOL S106 is co-taught and divided into two parts. Each will count as 50% of your grade.

BIOL S106 is co-taught by Professors Amaleah Hartman (Genes & Development) and Thomas Near (Ecology & Evolutionary Biology).

See below for the corresponding parts of the course each professor teaches, their contact information and office hours.

Please read the entire syllabus. This syllabus is a general guide, and subject to change if necessary.

General Class Information

BIOL S106 will have live lectures Monday-Friday 10:30-12:15 EST from July 1st – August 2nd 2024. Students are expected to attend in-person in **OML 202**. During the scheduled class time, students will be participating in group activities, answering and asking questions, and presenting live.

Textbook: *Life: The Science of Biology*, 10th, or 11th edition by Sadava et al. All additional assigned readings can be downloaded via the course website.

Feel free to use the 12th edition of the textbook, but note the authorship of the 12th edition is Hillis et al. *The textbook readings are not required and you will not be tested on their content.* However, you may find the textbook useful in understanding the material discussed in lecture.

Prerequisites: Passing grade in BIOL S105 or BIOL 101 and BIOL 102

Academic Integrity

Students are expected to read and understand “Appendix A” as outlined in the Yale Summer Session Handbook. A student violating the terms outline Appendix A of the Yale summer session handbook in any assignment, test, or examination in this class will receive a minimum penalty of a zero (0) for that exam, quiz or assignment, and may receive a grade of "F" for the course at the discretion of the instructors.

Part 1: Genes & Development - BIOL S106A

Instructor:

Amaleah Hartman, Ph.D. (she/her)

amaleah.hartman@yale.edu (<mailto:amaleah.hartman@yale.edu>)

Office Hours: TBD

Course Description

The goal of this course is to provide students with an introductory overview of developmental biology in selected animal model organisms, as well as genetics from the work of Mendel to our current understanding of the gene at the molecular level. There will be an emphasis on the importance of experimental approaches used to understand genetics and development in addition to critically considering selected challenges and issues related to these fields of study.

The lectures are designed to be interactive. In addition to instructor presentations, we will often break into small groups to discuss problems and analyze data allowing students to develop critical thinking and problem-solving skills.

Importantly, you will continue to develop your skills of reading and interpreting primary research articles, and how to construct precise and concise scientific writing in an independent research proposal, the culmination of your submitted homework assignments.

Expected Learning Outcomes

Students from this class will:

1. understand that genetic information is passed from parent to offspring, and the inherited traits can be predicted
2. understand that genetic information can change, leading to modified physical or physiological traits, which is the basis for variation, adaptation, and evolution; and can lead to development

gone awry, i.e., cancer

3. predict the outcomes of genetic crosses when parental genotypes or phenotypes are known
4. critically analyze the advantages and disadvantages of genetic manipulation
5. appreciate that development of multicellular organisms is progressive, and the fate of cells becomes determined at different times due to differential gene expression
6. understand that development is studied through selected model organisms and this is possible due to the conservation of similar developmental mechanisms of animals
7. identify the important function of stem cells in normal development and regeneration as well as their powerful uses and application in the study of disease and drug development
8. be able to analyze data relating to gene expression, cellular identity, and synthesize hypotheses regarding the regulation of gene expression and
9. understand tools, techniques, hypotheses and experiments that were used to generate our understanding of some of the key aspects of genetics and development

Methods of Assessment

Participation (20%)

4 Homework assignments, culminating into a short research proposal (30%)

3 quizzes, each over the previous four lectures (50%, lowest dropped)

Part II: Ecology and Evolutionary Biology - BIOL S106B

Instructor:

Thomas Near, Ph.D.

thomas.near@yale.edu (<mailto:thomas.near@yale.edu>)

Office Hours: Tuesdays and Thursdays, 2:00 PM to 3:00 PM, ESC 364

Course Description

An introduction to the fundamentals of evolutionary biology and ecology; an overview of patterns and processes in the history of Life on Earth; and an analysis of overarching themes in the interpretation of evolution and ecology.

Expected Learning Outcomes

Students from this class will:

1. Understand the lines of evidence leading to the discovery of evolution.
2. Articulate both natural selection and genetic drift as two mechanisms of evolutionary change.
3. Be able to define what is a species and critically understand the process of speciation.
4. Understand phylogenetics as the set of methods and "tree thinking" to infer the evolutionary relationships among and within organismal lineages.
5. With comparative data, be able to infer an optimal phylogenetic tree.
6. Articulate the modes of inference provided by the fossil record as how it relates to the history of life on Earth.
7. Understand limits on population growth, interactions among species, the concept of the niche, and island biogeographic theory.
8. Assess theories that discuss the origin of life.
9. Articulate the broad history of life on Earth that includes Archaea, Eubacteria, plants, Fungi, and animals.
10. Understand and articulate rates of evolution across the tree of life

Methods of Assessment

Six in-class quizzes, each over the previous two lectures (drop lowest quiz score) 50%

Two writing assignments 30%

Participation 20%

There are no make up quizzes. If you cannot make a class where a quiz is given you have the option of dropping that quiz.

Course Summary:

Date

Details

Due
