



Computational creativity for music and the arts

MUSIC 30

Instructor Info —



Carmine-Emanuele Cella



Center for New Music and Audio
Technologies (CNMAT)



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Course Info —



Prereq: None

Lab Info —



Lab Space

Overview

During the first half of this course, we will work up the fish phylogeny, examining both extinct and extant lineages. In the second half, we'll dive deep into the specific systems fish have developed that allow them to dominate the aquatic world. We'll spend the last few weeks looking at their behavior, ecology, and some of the conservation efforts currently underway to help protect our fish populations. Throughout the semester, labs will help students connect what they have read and heard with what they can see and feel, reinforcing the material.

Learning Objectives

- Become familiar with the evolutionary history and taxonomic diversity of fishes
- Improve your understanding of the basic physiological and behavioral adaptations of fishes
- Gain skills regarding the dissection, collection, and preservation of fish specimens through laboratory work
- Learn to critically review a paper and summarize it, as well as review and provide helpful criticism to your peers' work

Material

Required Texts

Helfman, G.S., Collette, B.B., Facey, D.E., & Bowen, B.W. *The Diversity of Fishes: Biology, Evolution, and Ecology*. 2nd Edition. Wiley-Blackwell. 2009. ("DOF")

Recommended Text

Paxton, J.R. & Eschmeyer, W.N. *Encyclopedia of Fishes*. 2nd Edition. Harcourt Brace & Co. 1998.

Other

Any required journal articles and book chapters will be provided on Canvas.

Grading Scheme

15%	Lab Worksheets
40%	Midterm Exams (20% each)
45%	Final Exam

Grades will follow the standard scale: A = 89.5-100; B = 79.5-89.4; C = 69.5-79.4; D = 60-69.4; F <60. Curving is at the discretion of the professor.

FAQs

? Do we dissect real fish in this course?

! Yes, we do actually dissect fish. If you know of any issues that may cause you difficulties during dissections, please notify your TA ASAP.

? What is a fish?

! No clue. When someone says 'fish', we have a picture of a general fish of a general shape in our minds, but the truth is that 'fish' doesn't have scientific meaning. Here's a funny video about that: Youtube ([hyperlink](#)).

? What is your favorite fish?

! A lumpsucker. They are incredibly, adorably weird-looking.

? What's the difference between plural 'fish' and 'fishes'?

! 'Fish' is the plural form when talking about two or more fish of the same species. 'Fishes' is the plural when talking about two or more different species.

Make-up Policy

Make-up exams or assignments will only be allowed for students who have a substantiated excuse approved by the instructor *before the due date*. Leaving a phone message or sending an e-mail without confirmation is not acceptable. Labs are mandatory.

Diversity and Inclusivity Statement

I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Disabled Students' Program (<https://dsp.berkeley.edu>), as soon as possible, to make an appointment to discuss your special needs. Please e-mail me in order to set up a time to discuss your learning needs.

Academic Integrity

Berkeley's honor code states "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others." The honor code is a cornerstone of our learning community and of this course. It is your responsibility to know and follow academic integrity policies. I will gladly answer any questions you have.

Harassment and discrimination

The University of California strives to prevent and respond to harassment and discrimination. Engaging in such behavior may result in removal from class or the University. If you are the subject of harassment or discrimination there are resources available to support you. Please contact the Confidential Care Advocate (sa.berkeley.edu/dean/confidential-care-advocate) for non-judgmental, caring assistance with options, rights and guidance through any process you may choose. Survivors of sexual violence may also want to view the following website: survivor-support.berkeley.edu. For more information about how the University responds to harassment and discrimination, please visit the Office for the Prevention of Harassment and Discrimination website: ophd.berkeley.edu.

Class Schedule

MODULE 1: Representations

Week 1	History of the Earth - Fish Remix	Friedman, M. & Salland, L.C. (2012). Five hundred million years of extinction and recovery: A Phanerozoic survey of large-scale diversity patterns in fishes. <i>Palaeontology</i> , 55(4):707-742
	Stem & Extant Agnathans & Gnathostomes	DOF Ch. 11, pp. 169-179; Ch. 13, pp. 231-240 Brazeau, M.D. & Friedman, M. (2015). The origin and early phylogenetic history of jawed vertebrates. <i>Nature</i> , 520(7548): 490-497.
Week 2	Chondrichthyans I: Overview & Sharks	DOF Ch. 11, pp. 197-200; Ch. 12, pp. 205-227
	Chondrichthyans II: Batoids & Chimaeras	DOF Chapter 12, pp. 227-229
Week 3	Stem & Extant Sarcopterygians	DOF Ch. 11, pp. 179-185; Ch. 13, pp. 242-248
	Actinopts I: Overview	DOF Ch. 14 & Ch. 15
Week 4	Actinopts II: Basal Actinopts & Teleostei	DOF Ch. 11, pp. 185-197; Ch. 13, pp. 248-259, Ch. 14, pp. 261-266
	Actinopts III: Otocephalan Fishes	DOF Ch. 14, pp. 267-275
Week 5	Actinopts IV: Freshwater Fishes	DOF Ch. 16, pp. 339-354; Ch. 18, pp. 410-414, 417-421
	Actinopts V: Deep Sea Fishes	DOF Ch. 18, pp. 393-401 Davis, M.P., Sparks, J.S., & Smith, W. L. (2016). Repeated and widespread evolution of bioluminescence in marine fishes. <i>PLOS One</i> .
Week 6	Actinopts VI: Coral Reef Fishes	Bellwood, D.R. & Wainwright, P.C. (2002). The History and Biogeography of Fishes on Coral Reefs. <i>Coral Reef Fishes: Dynamics and Diversity in a Complex Ecosystem</i> , 5-32.
	Actinopts VII: Pelagic Fishes	DOF Ch. 18, pp. 401-405
Week 7	Review	Module 1
	EXAM	MIDTERM 1

MODULE 2: What Makes a Fish

Week 8	Respiration	DOF Ch. 5
	Cardiovascular Systems	DOF Ch. 4, pp. 45-48
Week 9	Homeostasis	DOF Ch. 4, pp. 52; Ch. 7, pp. 101-105.
	Feeding Mechanisms	DOF Ch. 4, pp. 41-42; Ch. 8, pp. 119-126
Week 10	Sensory Systems	DOF Ch. 6
	Buoyancy	DOF Ch. 4, pp. 50-52 & Ch. 5, pp. 68-70

Week 11	Locomotion I - Undulatory Propulsion	Webb, P.W. (1984). Form and function in fish swimming. <i>Sci. Amer.</i> , 251(1): 72-83.
	Locomotion II - Oscillatory Propulsion	Daniel, T.L. (1984). Unsteady Aspects of Aquatic Locomotion. <i>Amer. Zoo.</i> , 24: 121-134.
Week 12	Communication & Reproduction	DOF Ch. 22, pp. 477-485
		DOF Ch. 21
	Review	Module 2
Week 13	EXAM	MIDTERM 2
	Holiday	Thanksgiving
MODULE 3:		
Week 14	Symbiotic Relationships	DOF Ch. 22, 492-497
	Behavior	DOF Ch. 23
Week 15	Ecology	DOF Ch. 25
	Conservation Efforts	DOF Ch. 26
Week 16	FINAL EXAM	Date & Time & Location

Lab Schedule

Week 2	Chondrichthyan Fishes	Students enjoy a two part lab: first, they examine specimens across the Chondrichthyan phylogeny; second, they dissect a small spiny dogfish shark.
Week 3	Harvard Natural History Museum	Students walk through the HMNH and the fossil collection, inspecting various fossil fishes.
Week 4	Basal Teleosts & Otocephalan Fishes	Students explore specimens across the basal Teleost phylogeny.
Week 5	Freshwater & Deep-Sea Fishes	Students explore specimens from a diverse group of fishes, and try to place each group in the broader phylogeny.
Week 6	Coral Reef & Pelagic Fishes	Students explore specimens from a diverse group of fishes, and try to place each group in the broader phylogeny.
Week 7	No Lab	
Week 8	Internal Systems	Students dissect fish specimens, probing and examining key internal systems.
Week 9	Jaw Dissections	Students again dissect their fish specimens, taking apart and visualizing the jaws of their fish.
Week 10	Sensory Systems & Buoyancy	Students again enjoy a two-part lab: first, examining a broad selection of specimens, comparing and contrasting sensory system apparatuses; and then conducting a series of small experiments to better understand the difficulties associated with buoyancy control in the water.
Week 11	Locomotion	Students dissect fish specimens, looking at muscular and structure of the body and fins. Students also participate in demonstrations designed to elucidate the concept of lift.
Week 12	Review Paper Projects	Students bring electronic devices and/or paper printouts of 2-3 paper choices, and will select peer reviewers. TAs will be available to assist students in choosing a paper and begin reviewing it.
Week 13	No Lab	
Week 14	No Lab	
Week 15	Final Exam Review Sessions	Review Paper Project Due