SIO 127: Marine Molecular Ecology
Spring Quarter 2020

Course Instructor:
Dr. Ron Burton, Scripps Institution of Oceanography
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Office Hours via zoom: by appointment (set up by email or Canvas inbox)
Don't be bashful - I'm happy to schedule time with each of you!

Course Description and Goals:

Molecular methods are now commonly used to address a broad range of questions in ecology and evolution. These tools have had an enormous impact on our understanding of marine organisms, revealing information about patterns of biodiversity, connectivity, and mating systems in natural populations. The role of genetic drift and natural selection in adaptation to the environment can be inferred from population analyses of whole genomes using methods that have become available only in the past few years. This course will survey the application of molecular methods to address diverse questions concerning the ecology and evolutionary biology in marine organisms. Students will learn how different molecular approaches can be applied to understanding how marine organisms adapt to their physical and biotic environments.

Course structure: Lectures on T/Th, 9:30 am - 10:50 am live via zoom (and recorded)
Thursday 11:00 am - Discussion (I'll stay online after lecture)

Lectures are important. It is NOT critical that you attend the T/Th sessions since they will be recorded and available on the Canvas course web site. However, since I need to record the lectures anyway, I hope some of you can attend the sessions and provide feedback and ask questions to enrich the recorded lectures.

Textbook (required): Text: Molecular Ecology (3rd edition, 2020) Joanna Freeland
Available electronically from the UCSD Library

The text provides a wealth of background information for many lecture topics, and expands on some topics we only touch on in class. The text is not focused on marine organisms but applies the same concepts to many terrestrial systems that are equally relevant to your understanding of molecular ecology. To help coordinate between lectures and the textbook, I've arranged lectures into "modules" that roughly correspond to chapters in the textbook

Additional course readings, consisting of primary literature, will occasionally be assigned in class then posted on the Canvas website.

Assignments - there will be a few of homework assignments designed to get you engaged in the material and allow me to make sure we are all on the same page. These will include two one-page papers.

- **Homework assignments** **50 pts**
- **Quizzes** **50 pts**
- **Final** **100pts**

Module	Lecture Topic	Text reading
1	**Introduction and History of Molecular Ecology**	**Chapter 1**
	Lecture 1 Introduction to Molecular Ecology	
2	**Species Identification and Application**	**Chapter 3**
	Lecture 2 DNA Barcoding	
	Lecture 3 Metabarcoding, Metagenomics, eDNA	
	Lecture 4 Microbiomes, microbial ecology and metagenomics	
3	**Methods in Molecular Ecology**	**Chapter 2**
	Lecture 5 Genetic markers: Allozymes to SNPs	
4	**Theoretical Background**	**Chapter 5**
	Lecture 6 Population genetics 1: drift and effective population size	
	Lecture 7 Population genetics 2: migration and natural selection	
5	**Genes and Individual Fitness**	
	Lecture 8 Functional ecology: molecular adaptations at single loci	
	Lecture 9 Functional ecology: transcriptomics and regulatory variation	
	Lecture 10 Natural Selection	
6	**Behavioral Ecology**	**Chapter 7**
	Lecture 11 Mating systems	
7	**Population Differentiation and Speciation**	**Chapter 6**
	Lecture 12 Population structure	
	Lecture 13 Phylogeography	**Chapter 4**
	Lecture 14 Hybrid breakdown	
	Lecture 15 Speciation	
8	**Molecular Ecology Applications**	**Chapter 8**
	Lecture 16 Fisheries genetics 1	
	Lecture 17 Fisheries genetics 2	
	Lecture 18 Conservation genetics	

Academic integrity:

Integrity of scholarship is essential for an academic community. For students, this means that all academic work will be done by the individual to whom it is assigned, without unauthorized aid of any kind. All suspicions of integrity violation will be reported to the Academic Integrity Office according to university policy. Integrity violation is not just blatant cheating (e.g., copying off another student during an exam), but include copying other students' papers or homework, copying or using old papers/report, working with others on individual assignments. Those students found to have committed academic misconduct will face administrative sanctions imposed by their college Dean of Student Affairs and will also face consequences for this course which may range in severity from an F on the exam or assignment to an F in the course. Students who assist in or are complicit with cheating could also be in violation of the Policy. Thus, students who become aware of their peers either facilitating academic misconduct or committing it should report their suspicions to us for investigation. For more information on academic integrity please refer to The Policy on Integrity of Scholarship (academicintegrity.ucsd.edu).