**SIO 278 Seminar in Ocean Sciences: Genomics of Adaptation and Speciation**

Th 11:00-12:20 HH4500 (when in person) or via Zoom

2 units

**Instructor: Ron Burton rburton@ucsd.edu**

**Hubbs Hall 2140**

**Goal of this seminar:** To acquaint students with the concepts of local adaptation and speciation and then discuss the application of genomic technologies to address questions of how marine organisms adapt to local environments and how new species evolve in ocean habitats. The pros and cons of different genomic methods will be discussed. We will assume only minimal background in evolutionary genetics, molecular ecology and genomics.

**Format:** Like most graduate seminars, we will focus on student-led discussions of primary literature and review articles. Two students will be assigned to each meeting date. They will have the flexibility to decide how to best approach the topic - they may each lead a discussion of one or more papers in succession or team up on each paper, maybe in point-counterpoint style to stimulate group discussion. The goal is to stimulate some discussion!

**Requirements to pass the course**: I expect students to show some level of engagement **each** week - read the papers, ask questions, participate in discussion. Twice during the quarter each student will be part of the team leading the discussion. Absences (e.g., for a research cruise or field trip) should be cleared with me in advance.

Papers for discussion can (should) be student-selected in consultation with the instructor and will be posted on the Canvas website by Tuesday (at the latest) each week. Papers can be straightforward examples of genomic applications in marine systems, but they need to be critically assessed - what are the assumptions and limitations of the work? Can we accept the authors' conclusions? Is there a better approach? Review articles can be great when they point out generalities of the existing literature, both positive and negative, so it is often a good idea to start discussion with a review article and then consider a couple of papers that are "case studies" of how genomics methods have been employed to (hopefully) yield better understanding than other more traditional methods. Some of the statistical analyses will likely be beyond the scope of the seminar, but we should be able to work through how the authors got from field or experimental populations to their genomic data.

**Auditors** are welcome to attend and join in the discussions (schedule of topics and moderators is below!

# Schedule for seminar discussions:

| Date | Discussion Leaders | Topic |
|---|---|---|
| Jan 6 | Ron | Introduction, Role of common garden and reciprocal transplant experiments |
| Jan 13 | Ron | Adaptive changes in gene expression |
| Jan 20 | Ethan and Noah. | Can selection result in local adaptation in the face of gene flow? |
| Jan 27 | Abby and Mackenzie. (and Tim) | RAD-seq as an approach to studying adaptation? |
| Feb 3. | Michaela and Christina. | The environment is changing rapidly – can evolution keep up? |
| Feb 10 | Avery and Marina. | Low-coverage whole genome sequencing: methods and applications |
| Feb 17 | Noah and Abby | Speciation |
| Feb 24. | Ethan and Christina and Azsha | Role of mitochondria and sex chromosomes in speciation |
| Mar 3 | Michaela and Mackenzie? and Azsha | Genetic architecture of adaptation |
| Mar 10. | Avery and Marina. | Comparative transcriptomics |