

SYMBIOSIS IN THE MARINE ENVIRONMENT

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Course Description

Symbiosis is a very pervasive phenomenon in biology. There are, in fact, no known organisms that exist in isolation. EVERYTHING exists in association with other organisms, and often in a complex community of other organisms. Since the oceans represent the largest habitable environment on Earth, it is no surprise that an astonishing diversity of symbiotic associations can be found there. Although marine symbiosis is an enormously broad subject that can't realistically be covered in a single course, I will make an attempt to touch on a variety of such associations, including some that are locally accessible. (Also, although this is Marine Symbiosis, we are going to sneak in a few freshwater and terrestrial symbioses, as well. You will not be disappointed.)

The term "symbiosis" is difficult to precisely define, and has different meanings for different biologists. I choose to use the broadest definition possible, in order to illustrate the vast expanse of intimate interspecific relationships that exist in the living world. For our purposes, we will use the term symbiosis in the way that DeBary defined it when he coined the term in 1879: "the living together of differently named organisms" (translated from the German "des zusammenlebens ungleichnamiger Organismen"). This includes not only symbiotic relationships typically termed "mutualistic," but also commensal and parasitic symbiosis. We will also cover certain behavioral co-adaptations among marine organisms that don't qualify as symbiosis strictly speaking, but are nevertheless important and fascinating interactions, with significant impact on the fitness of the participants.

The course will include lectures on a variety of marine symbiosis and coevolution topics, as well as laboratory work. I will bring in as many symbiotic systems as I can within our means. In addition, we will be visiting local tide pools to see some spectacular examples of algal symbiosis and to collect a few tentacles for observation in the lab. We will also isolate bioluminescent bacteria that occur as transient gut symbionts of marine fish caught off the Oregon coast. (Unfortunately, OIMB's education budget does not permit a submersible dive to hydrothermal vents off the Galapagos Islands, or to cold methane seeps in the Gulf of Mexico, or a snorkeling trip on the Great Barrier Reef!! However, we will do our best to bring those systems to you in the form of electronic technology!)

There is no textbook, largely because I can't find one that covers this range of topics (and I am unlikely to write one before summer!). Instead, powerpoints and class notes will be made available to everyone so that you'll have easy access to pretty much everything I say in lecture.

Course Schedule:

Introduction

Algal symbiosis

Light organ (bioluminescent) symbiosis

Gut symbiosis

Sulfur and methane symbiosis at vents and seeps

Microbial syntrophy in the marine environment

Sponge/microbe symbiosis

Commensalism and mutualism in marine animals

Behavioral co-adaptation

Marine parasitism

Molecular symbiosis

Symbiotic origin and evolution of organelles

The course grade will be based on an exam given on the afternoon of last day of class, and on participation in lab activities.