

Marine Natural Products
SIO 124
Syllabus (new course)
(4 units, Tues and Thurs, Spring quarter, instructor: Paul Jensen)
T/TH 10:00-11:20

Overview: This course will provide a detailed introduction to marine natural products (MNPs). It is geared for upper level undergraduate and graduate students who are interested in gaining a fundamental understanding of this field. Organic chemistry would be a useful pre-requisite for this class. It will start with an introduction to marine natural product chemistry including descriptions of various structural types of natural products and the mechanisms of their biosynthesis. The basic techniques of natural product isolation and structure elucidation will be introduced. This will be followed by an overview of the types of marine organisms that have been studied as a source of natural products and how they are collected, processed, and screened for biological activities. The methods used to study natural products from marine microorganisms will also be described, including isolation and fermentation techniques. The second half of the course will cover new methods for natural product discovery. This will include a range of “omic” sciences that have transformed this field in recent years. This will be followed by a series of lectures addressing what we know about why these compounds are produced in nature. Finally, the course will conclude with an overview of commercialized marine natural products and an introduction to patent law and how university discoveries are developed. Grades will be assigned based on attendance and participation (10%) and exam scores (90%).

Week 1:

4 April Lecture 1: Course objectives. Introduction to marine natural products. History of the field
6 April Lecture 2: Classes of compounds and their biosynthesis.

Week 2:

11 April Lecture 3: Compound isolation, methods of structure elucidation
13 April Lecture 4: Bioassays, pharmacology, MNPs as probes

Week 3:

18 April Lecture 5: Macroorganisms I: diversity, distributions, natural product discovery
20 April Lecture 6: Macroorganisms II: diversity, distributions, marine toxins

Week 4:

25 April Lecture 7: Macroorganisms III: How to collect and document
27 April Lecture 8: Microorganisms I: diversity, distributions, cultivation independent

Week 5:

2 May Lecture 9: Microorganisms II: sample collection and processing, culture collections, fermentation methods, co-culture, extraction methods
4 May Lecture 10: Microorganisms III: natural products: who makes what, important examples

Week 6:

9 May **Mid-term exam (45%)**
11 May Lecture 11: New methods in natural product discovery: Genomics

Week 7:

16 May Lecture 12: Marine natural products in practice. Guest lecture Bill Gerwick
18 May Lecture 13: Metabolomics/chemical interactions: Guest lecture Nick Tuttle

Week 8:

23 May Lecture 14: Chemical ecology: Guest lecture Alyssa Demko

25 May Lecture 15: Meta-omics. Guest lecture Eric Allen

Week 9:

30 May Lecture 16: New methods in natural product discovery

01 June Lecture 17: Chemical ecology/microorganisms

Week 10:

06 June Lecture 18: Marine natural products as drugs. From discovery to the clinic

08 June Lecture 19: Biotechnology/applications, Patent law and academic inventions, research funding.

Finals week: exam (45%)