CLFS 680: Chemical Ecology

Syllabus

An examination of the utilization of organic natural products by plants and animals for various life processes. Examples will include how materials are utilized for sexual selection, defense against predators, sexual attractants, natural herbicides and repellants. Key questions such as physiological adaptation to these materials and the adoption of them by humans for other purposes will be examined. Subjects will range from poison (dendrobatid) frogs to trail substances in social insects.

Unit One: Introduction and Overview

- Objectives
- Why Chemical Ecology
- Synthetic Chemicals vs Natural Products
- Remember Some Basic Chemistry
- Terpenes
- Steroids
- Alkaloids
- Proteins and Nucleic Acids
- Natural Products - What we Obtain Directly From Nature
- Assignments
- Review

Unit Two: Pheromones

- Objectives
- Introduction
- Bombykol - the "first" pheromone
- How do pheromones work
- The diversity of pheromones
- Methods to detect pheromonal activity
- Disparlure -The Gypsy moth Attractant
- The Bark Beetle
- Strategies that use pheromones to protect plants.
- Assignments
- Review
Unit Three: Chemical Defense

- Objectives
- Chemical Defense: Introduction
- Apheloria. The Cyanide Bug
- The Bombardier Beetle
- The Firefly
- The Puffer Fish
- The Dendrobatid Frogs
- Review
- Assignments

Unit Four: Sexual Selection

- Objectives
- Co-Evolution and Chemical Defense
- Sexual Selection-Chemical Defense in Utetheisa Ornatrix
- Cosmosoma myrodora: Same Strategy, Different Procedure
- The Pyrrolizidine Alkaloids
- The Monarch Butterfly
- Beetle Defense: Cantharidin
- Review
- Assignments

Unit Five: Plants Objectives

- Plant structure and organization
- Comparison of plant and humane immune systems
- Plant chemical defenses: constitutive and induced
- Trophic levels: "With a little help from my friends"
- Colors and fragrances: signals for insects and other animals
- Review
- Assignments

Unit Six: Microorganisms

- Objectives
- Antibiotics: penicillin, erythromycin, and vancomycin use and misuse
- Immune supression: cyclosporin
- Enzyme inhibitors: lovastatin
- Mycotoxins; ergot alkaloids and aflatoxins
- Genomics and the manipulations of biosynthetic pathways: The new millennium
- Review
- Assignments
Unit Seven: Marine Natural Products

- Objectives
- Seaweed sex pheromones
- Chemical attractant
- Antifeedants
- Venoms and toxins: cone shell polypeptides, the polyether toxins (ciguatoxin, brevetoxin, and palytoxin), microcystins from cyanobacteria
- Review
- Assignments