

Syllabus (and other details)

Text: Medicinal Natural Products, 3rd edition, Paul Dewick, Wiley Press, 2009
Murder, Magic and Medicine, revised edition, J. Mann, Oxford Press, 2001

This course is a one semester, lecture only, survey of the field of natural products, which are often referred to as 'secondary metabolites'. The term secondary metabolite is in reference to their biological formation, or anabolism. Similar to primary metabolism natural products are produced by enzyme mediated reactions but unlike primary metabolites are not necessary for the maintenance of individual life-forms. Although primary metabolites are universally distributed and similar across all life, secondary metabolites are often unique to specific species. In fact, secondary metabolites have sometimes been used as taxonomic markers. The exact role and evolution of these molecules is poorly understood and probably results from several influences, including random experimentation.

The study of natural products draws from many disciplines. Their isolation and structure elucidation was responsible for much of the early developments of chemical theory and laboratory techniques. The total synthesis of natural products is still a mainstay of organic chemistry. The biosynthesis of natural products is closely related to primary metabolism and is increasingly an area of biochemical research including gene modification. As many natural products have medicinal properties their catabolism and influence on primary metabolism is of importance to medicinal chemist, physicians and pharmacist. The relationship between plants and humans has occupied herbalist for millennia.

However, the study of natural products goes beyond the fields of chemistry and biology. The use of natural products as medicines, poisons, phantastica, dyes and in religious ceremonies has influenced the economic and social developments of nations to a degree rarely appreciated even by those study the rise and fall of societies. Natural product lore is woven throughout the legends and mythology of our past, an all cultures, since the beginning of recording time and almost certainly earlier.

What then constitutes a one unit course in natural products? Our core focus will be on the structure and biosynthesis of the four main classes of secondary metabolites: polyketides, shikimate derivatives, isoprenoids and alkaloids as well as metabolites of mixed origin. Synthesis and structure elucidation will be covered only to the extent needed to understand how biosynthetic pathways are uncovered. I hope that some of you, through your specific interest, will add and embellish on my simple and basic presentation.

In addition, I plan to intertwine other aspects of the development and study of natural products. In mostly anecdotal form we will look at the influence of several compounds on the history of our relatively young species. I hope to touch on the folklore surrounding the medicinal use of plants, on plant-insect interaction (chemical ecology), the use of hallucinogens in rituals and finally the future of natural product research.

Grading: As this is an upper level course populated by mature and sophisticated students I will eschew in-class examinations and instead use problem sets, short papers, take home assignments and class presentations. Some of what we do will arise from your comments. You will need to work independently and utilize secondary sources including library books, the internet and primary literature. All I ask of you is to leave the grades to me. You do your best and let the chips fall where they may. In general the more excited you are the better you'll do; and that is the way it should be.

Your assignments will fall into two categories, individual and team. For each section you will be given a take-home assignment and work in a team of three. I will change the team members for each assignment. You will also have a number of individual assignments. For example I will have a series of short answer questions taken from the Mann book which we will read over the first third of the course. You are encouraged to give a short in-class presentation on a topic of your choosing. I also expect you to write at least one monograph on a natural product (or related topic) for inclusion in our WEB site. To start that each student will be required to write a short review on one of the class books we use as resources. And finally, you will write a term paper due at the end of the course. Specifics on some of these assignments may be found in pdf files located on our WEB site.

Schedule I don't have a well planned, detailed, schedule and I don't want one. We will spend the first portion of each class with the traditional lecture. Then I would like to have you participate in the form of discussions, presentations and what ever else we can come up with. The core of the course will be drawn from our primary text, 'Medicinal Natural Products'. We will essentially do the first six chapters with supplemental material along the way. Here is a list of general topics some of which we will deal with only briefly.

- I. Introduction. Examples of natural products
- II. The tools of biosynthesis; coenzymes and primary metabolism
- III. The alkaloids in the historical development of natural products
- IV. Polyketides and fatty acid metabolism
- V. The shikimic acid pathway
- VI. Mevalonate and the terpenoids
- VII. Alkaloid and amino acid biosynthesis. The central nervous system.
- VIII Marine natural products
- IX. Ecological natural products

