Chemistry 137b Natural Products     Spring 2017

Block C, MWTh 10:00 AM  Place Shapiro Science Center LL 16

Prof. Snider, EL 225, X 6-2550, snider@brandeis.edu
Office hours: Drop in anytime 9:30 to 5:30 or by appointment.


On Reserve:
(QH521 M36 1987) Mann, John; Secondary Metabolism 2nd edition
(QD415 N365 1994) Mann, John; Natural Products: their chemistry and biological significance
(QD415 B43 2009) Bhat, Sujata V; Nagasampagi, Bhimsen; Sivakumar, Meenakshi; Natural Products: chemistry and applications
(RS160 D48 2009) Paul M. Dewick; Medicinal Natural Products: a biosynthetic approach, 3rd edition
(QP550 M38 2005) McMurry, John; Begley, Tadhg; The organic chemistry of biological pathways, 1st edition
(QP550 M38 2016) McMurry, John; Begley, Tadhg; The organic chemistry of biological pathways, 2nd edition

Content: The course will cover the structure, biosynthesis and biomimetic synthesis of natural products (secondary metabolites). The organization will be biosynthetic: acetogenins, shikimates, terpenes, and alkaloids with an emphasis on the organic chemistry, rather than the enzymology, in the biosynthesis of these compounds.

Learning Goals: Upon completion of this course, students will have an advanced understanding of the biosynthesis of natural products (secondary metabolites) especially acetogenins, shikimate-derived natural products, terpenes, and alkaloids. Students will understand the chemistry used by enzymes in the constructions of these molecules and will enable to analyze the biosynthesis of new natural products. Students will appreciate the importance of biosynthetic knowledge for designing syntheses, especially biomimetic syntheses. This course will also expose students to the primary literature and emerging areas of chemical research related to natural products and biosynthesis.

Attendance: Regular class attendance is expected. Material covered in class may not be in the book and will be covered on exams.

Examinations: There will be two hour exams in class and a final exam. Reviews sessions will be held before each exam and the final.

Homework: Three to six homework sets will be assigned throughout the semester. A term-paper will be required.

Workload: Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (reading, studying, completing homework assignments) in addition to the 3 hours of lecture.

Grades: The final grade will be determined as follows: two hour exams (2 x 100 points), final exam (200 points), term paper (100 points) and homework (100 points) for a total of 600 hundred points.

Latte: Copies of the syllabus, handouts, and test and homework answers will be placed on Latte. The library
has (should have) the text and the books indicated with * on the following page on reserve.

**Prerequisites:** Chem 25b. Biochemistry 100 will be helpful, but is not needed.

**Regrading:** I do make mistakes in grading and will happily regrade exams and homework. However, please be advised that I will look at the entire exam/homework during regrading; scores may go down as well as up! Exams and homework must be submitted for regrading within one week of when they are first returned to the class.

**There are no makeups for hour exams.** If you have a valid medical or other excused absence you will receive the average of your grades on the other exam and the final. If you will miss an exam for medical reasons please let me know **beforehand** by phone/e-mail unless you are hospitalized, etc. If you are absent for any other reason, you will receive a 0. The registrar controls the final exam. An excused absence will result in an incomplete with a makeup final to be administered by the registrar's office in September 2017.

**Student Disabilities:** If you are a student with a documented disability at Brandeis University and if you wish to request a reasonable accommodation for this class, please contact the Office of Disabilities Services immediately: [http://www.brandeis.edu/acserv/disabilities/undergradstudents.html](http://www.brandeis.edu/acserv/disabilities/undergradstudents.html).
[http://www.brandeis.edu/acserv/disabilities/graduatestudents.html](http://www.brandeis.edu/acserv/disabilities/graduatestudents.html) Please keep in mind that reasonable accommodations are not provided retroactively and that the University takes some time to process requests. The usual accommodation (50% extra time) is typically dealt with by extra time after the other students complete the exam.

**Academic Integrity:** Each student in this course is expected to abide by the Rights and Responsibilities Handbook ([http://www.brandeis.edu/studentaffairs/srcs/rr/index.html](http://www.brandeis.edu/studentaffairs/srcs/rr/index.html)), with particular emphasis on section 4. The exams are to be taken without access to notes, calculators, or text and without assistance from another student. Instances of alleged dishonesty will be reported to the Brandeis Student Rights and Community Standards Office. Infringement of academic honesty by a student subjects that student to serious penalties, which may include failure on the assignment, failure in the course, suspension from the University, or other sanctions. If you have any questions about my expectations, please ask.

**Cell phone and Laptop Use.** I come to class to help you learn, and I assume that you are here because you want to learn. Using a cell phone or laptop to talk, text, email or surf the web on non-course related matters is disrespectful to me and to your fellow students. **Use of cell phones or laptops in class for talking, texting or reading/writing email is prohibited.** You are free to take notes or follow the lecture presentation on a laptop/tablet.
Reference List for Chem 137b

Secondary Metabolism

* Bhat, Sujata Natural Products: Chemistry and Applications 2009
Geisman, T. A. & Crout Organic Chemistry of Secondary Plant Metabolism 1969
Haslam, E. Metabolites and Metabolism 1985
Hendrickson, The Molecules of Nature 1965
Herbert, R. B. The Biosynthesis of Secondary Metabolites 1989
Luckner, M. Secondary Metabolism in Microorganisms, Animals and Plants 1984
* Mann, J. Secondary Metabolism 1987
  Mann, J. Magic, Murder and medicine 1992
* Mann, J. Natural Products: Their Chemistry and Biological Significance 1994
* McMurry, John E and Begley, Tadhg The Organic Chemistry of Biological Pathways 2005
Richards and Hendrickson, Biosynthesis of Terpenes, Steroids and Acetogenins 1964
Thomson, R. H. Ed. The Chemistry of Natural Products 1993
Torssell, K. Natural Product Chemistry 1983
Pietra, Francesco, Biodiversity and natural product diversity

Specific Classes of Natural Products

Dobler, M. Ionophores 1981
Erman, Chemistry of the Monoterpenes 1985
Newman, Chemistry of Terpenes and Terpenoids 1972
Pace-Asciak and Granstron, Prostaglandins and Related Substances 1983
Roberts & Scheinmann, New Synthetic Routes to Prostaglandins and Thromboxanes 1982
Weiss, Edward, The Biosynthesis of Aromatic Compounds 1980

Total Synthesis

ApSimon, Total Synthesis of Natural Products, Volume 1-10
Anand, Bindra, Art in Organic Synthesis (first and second editions)
Bindra, Bindra, Creativity in Organic Synthesis (volume 1 only)
Blickenstein, Ghosh, Wolf, Total Synthesis of Steroids
Corey, The Logic of Chemical Synthesis
Fleming, Selected Organic Syntheses
Ho, Carbocycle Construction in Terpene Synthesis
Kocovsky, Synthesis of Natural Products, Problems of Stereoselectivity 1986
Koskinen, A. Asymmetric Synthesis of Natural Products 1993
Nakanishi, et al., Natural Products Chemistry, Vol 1-3

Reviews

Natural Products Reports (Review journal started in 1984 with reviews on all aspects)
Progress in the Chemistry of Organic Natural Products (Annual Volumes now >50)

* (on reserve)