

## **Reflections on course development – Piedmont Project**

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The major challenge which presented itself during development of this course was not knowing which department would ultimately offer the class. Being a faculty member of the Yerkes center gives me little interaction with main campus, and though we are working towards an Emory Assistant Professor appointment for the coming Spring semester, it has not yet been decided whether this appointment will be in the department of Pharmacology or Psychology. The content of this course depends in large part on where I end up. For example, I have planned to spend two classes talking about basic principles of pharmacology, but this will be unnecessary if pharmacology graduate students are enrolled! Likewise, there is a fairly heavy reliance on primary scientific literature, which may prove too much for psychology undergraduates.

A somewhat lesser obstacle was choice of textbook. The field of pharmacognosy remains relatively fractured, so books are either too chemistry-based or too sociology oriented for my intended purposes. Furthermore, many of these texts retain the ancient herbalist tradition of including color plates illustrating the various plants. This is visually pleasing, but increases the cost of these books quite a bit. As the purchase of textbooks is an economic decision, I prefer to find inexpensive texts, where possible. In the end I decided on two books. *Fundamentals of Pharmacognosy and Phytotherapy* by M. Heinrich et al. is especially strong in the history and scientific rationale of natural products, but *The Constituents of Medicinal Plants* by A. Pengelly excels in explaining the chemistry of these compounds in an easy to understand manner.

The coursepack readings were relatively easy to assemble. One of my goals for this course is to engage the students in primary scientific literature. I chose natural plant products which I believe are familiar or interesting – some articles are scientific reviews, while others are research reports. These articles will be used to bolster more discussion-based class sessions, where students will have the opportunity to consider real world applications of the principles they will be exploring throughout the semester.

# Pharmacognosy and the search for new medications in a changing environment

## ***Department Course Number – Semester year***

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### **COURSE DESCRIPTION:**

Pre-industrial cultures discovered a multitude of naturally-occurring therapeutic substances in the plant and animal kingdoms. The basics of medicine in general, and pharmacotherapy in particular, were established by these early cultures and passed on by oral tradition, or less frequently, written in texts dealing with herbal preparations. A great many of today's commonly-used drugs were developed through the study of indigenous remedies, and medicinal chemists continue to use plant-derived drugs as archetypes in their efforts to synthesize new compounds with increased efficacy and decreased toxicity. Recognizing the environmental consequences often imposed by modern life, the preservation of knowledge of local herbal remedies, the promotion of alternative therapies in Western health care, and the conservation of biodiversity have attracted increasing attention and concern among social and natural scientists.

This course proposes to introduce students to the scientific study of indigenous medicines. Particular attention will be focused on the interdisciplinary nature of ethnopharmacological research. How is knowledge of traditional remedies brought to the attention of modern scientists? How are pharmacologically active compounds identified and purified from plant- or animal-derived material? How, and why, are these naturally-occurring compounds modified by chemists? How are the resulting analogues tested for efficacy *in vitro* and *in vivo*? And what is the likely impact of modern encroachment on the environment to the continued discovery of "new" and potentially useful medicinal compounds? Specific examples will be discussed, including the plant-derived aporphine nantenine (which may be a selective "antidote" for the effects of the abused drug 'ecstasy') and the plant-derived diterpene salvinorin A (the most potent naturally-occurring hallucinogen, but also a potential basis for a new type of opioid analgesic.)

**READING:** The majority of the lecture material in this course will be drawn from *Fundamentals of Pharmacognosy and Phytotherapy* by M. Heinrich et al. (**required**), and from *The Constituents of Medicinal Plants* by A. Pengelly (**required**). Exams may also ask thought questions culled from issues raised in the coursepack articles, which will be drawn from the primary scientific literature and posted to the course website.

**GRADING:** There will be 4 non-cumulative exams throughout the semester. Exams will consist of multiple-choice, short answer, and brief essay questions. Exams will account for 100% of your final grade in the course and will be equally weighted (25% each) unless circumstances dictate otherwise. Grades in this course will not be curved (they won't need to be.)

**CLASS SCHEDULE:**

(CP = coursepack, H = Heinrich et al., P = Pengelly)

<b>Exam</b>	<b>Date</b>	<b>Lecture</b>	<b>Readings</b>
	1	Welcome / course plan	H chapter 1
	2	History of natural products	H chapter 2
	3	Basic plant biology 1	H chapter 3
	4	Basic plant biology 2	H chapter 4
	5	→ <i>Woods Walk</i> ←	CP article 1 – Davis
	6	Discussion day	review everything!
	7	<b>EXAM 1</b>	
	8	Basic pharmacology 1	
	9	Basic pharmacology 2	
	10	Phenols	P chapter 2
	11	<i>Salicylic acid</i>	
	12	Glycosides	P chapter 4
	13	<i>Hypericum perforatum</i>	CP article 2 – Mennini and Gobi
	14	Discussion day	review everything!
	15	<b>EXAM 2</b>	
	16	Terpenes	P chapters 5 and 6
	17	<i>Salvia divinorum</i>	CP article 3 – Sheffler and Roth
	18	Essential oils	P chapter 7
	19	<i>Aromatherapy: science or scam?</i>	CP article 4 – Thomas
	20	Alkamides	P chapter 8, pages 115-120
	21	<i>Echinacea angustifolia</i>	CP article 5 – Turner et al.
	22	Discussion day	review everything!
	23	<b>EXAM 3</b>	
	24	Alkaloids	P chapter 10
	25	<i>Drugs of abuse</i>	CP article 6 – Halperin
	26	<i>Nantenine</i>	CP article 7 – Fantegrossi et al.
	27	Discussion day	review everything!
	28	<b>EXAM 4</b>	

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## Honor Code

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All students wishing to take this class this semester **must** sign this honor code and turn it in to me within the first two weeks of class. Failure to do so will result in disenrollment from the course. Please read this page, ask questions if you don't understand it, and get it turned in to me as soon as possible.

**Plagiarism** occurs whenever you attempt to present somebody else's intellectual work as your own. Your use of any of the following, without appropriate citation of the source, is considered plagiarism:

- spoken or written words of another person
- paraphrased summary of another person's spoken or written words
- papers you downloaded off the internet, "borrowed" from a friend, etc.

If you are unsure whether or not you have correctly cited the work of another in any of your written assignments, ask me. I will help you out.

Another practice which Emory University considers plagiarism is the turning in of a paper that you have previously turned in for another class. Your papers are not allowed to work double shifts. All assignments for this class must be your own original works!

**Cheating** occurs whenever you attempt to use supplemental material on an exam. This includes, but is not limited to, hidden notes, looking at somebody else's paper, texting messages back and forth on cell phones, digital note files stored on laptops or palmtop devices, etc. Everybody knows what cheating is.

All answers on your exams must originate in the grey goo of your brain, leak down your arm, and come out your pen or pencil. Any interference or help along the way is cheating.

**THE PENALTY FOR CHEATING OR PLAGIARISISM, EVEN IF IT IS YOUR FIRST OFFENSE, IS A FAILING GRADE IN THIS COURSE AND FURTHER DISCIPLINARY ACTION BY THE DEAN.**

By signing below you acknowledge that you have read these policies and agree to abide by them for the duration of the semester.

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Print name above

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Sign and date above

## **Coursepack readings (available on course webpage)**

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1. Davis EW (1995) Ethnobotany: an old practice, a new discipline. In: Schultes RE and von Reis S (Eds.) Ethnobotany: evolution of a discipline. Timber Press, Portland, OR
2. Mennini T and Gobbi M (2004) The antidepressant mechanism of *Hypericum perforatum*. *Life Sci* 75(9):1021-7
3. Sheffler DJ and Roth BL (2003) Salvinorin A: the "magic mint" hallucinogen finds a molecular target in the kappa opioid receptor. *Trends Pharmacol Sci* 24(3):107-9
4. Thomas DV (2002) Aromatherapy: mythical, magical, or medicinal? *Holist Nurs Pract* 16(5):8-16
5. Turner RB, Bauer R, Woelkart K, Hulse TC and Gangemi JD (2005) An evaluation of *Echinacea angustifolia* in experimental rhinovirus infections. *N Engl J Med* 353(4):341-8
6. Halpern JH (2004) Hallucinogens and dissociative agents naturally growing in the United States. *Pharmacol Ther* 102(2):131-8
7. Fantegrossi WE, Kiessel CL, Leach PT, Van Martin C, Karabenick RL, Chen X, Ohizumi Y, Ullrich T, Rice KC and Woods JH (2004) Nantenine: an antagonist of the behavioral and physiological effects of MDMA in mice. *Psychopharmacology* 173(3-4):270-7