

## DRUGS AND THE BRAIN: MCB C62 / L&S C30T

Department of Molecular and Cell Biology  
College of Letters & Science, Discovery Course

University of California, Berkeley - Fall Semester 2018

Psychoactive drugs - stimulants, sedatives, psychedelics, analgesics, antidepressant and antipsychotic pharmaceuticals, and others - powerfully impact the human brain and mind. Understanding these substances and their effects vividly illustrates connections between botany, chemistry, cell biology, physiology, psychology, sociology, public policy, and constitutional law. This class will explore this territory, emphasizing the complex nature of drugs as both medicines and poisons emanating from plants and fungi that have enjoyed deep historical relationships with humankind.

Two Required Lectures and one Required Discussion Section meeting each week.

**Lecture times:** Tuesday and Thursday at 11:00 AM to 12:30 PM - Wheeler Auditorium

**Instructor:** David Presti 249 Life Sciences Addition (LSA)  
phone and voicemail: 643-2111 <presti@berkeley.edu>

**Office hours:** Tuesday 2:00 to 2:30 PM and Thursday 3:45 to 4:30 PM in 249 LSA.

**Required text:** *Pharmako/Poeia* by Dale Pendell North Atlantic Books, Berkeley

**Optional texts:** For those who enjoy *Pharmako/Poeia*, you may also enjoy the two other members of the *Pharmako* trilogy:

*Pharmako/Dynamis* by Dale Pendell North Atlantic Books

*Pharmako/Gnosis* by Dale Pendell North Atlantic Books

For those wishing a comprehensive and concise introduction to cellular and molecular neuroscience, covering and greatly expanding upon material discussed in class:  
*Foundational Concepts in Neuroscience: A Brain-Mind Odyssey* by David Presti

**Other course readings:** There will be additional readings posted throughout the semester on our class website at [bcourses.berkeley.edu](http://bcourses.berkeley.edu).

Graduate student instructors (GSIs) and their email addresses:

Adam Eichenbaum	<eichenbaum@berkeley.edu>
Celia Ford	<celia_ford@berkeley.edu>
Christine Tseng	<christine_tseng@berkeley.edu>
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Sylvia Madhow	<sylvia_madhow@berkeley.edu>

The GSIs are here to help you get the most from this class. You are encouraged to get to know and talk with your GSI. Your GSI will see you in weekly Discussion Section and will also be available to meet with you during weekly office hours. Moreover, you may visit office hours for any of the GSIs.

This is an opportunity to maximize your benefiting from our class. Don't be shy!

Discussion section times and locations:

101	Mon	9-10	2038 VLSB	Adam
102	Mon	10-11	202 Wheeler	Sylvia
103	Mon	12-1	B56 Hildebrand	Sylvia
104	Mon	2-3	215 Dwinelle	Daniel
105	Mon	3-4	258 Dwinelle	Daniel
106	Mon	4-5	255 Dwinelle	Jessica
108	Tue	1-2	20 Wheeler	Ellen
109	Tue	2-3	220 Wheeler	Ellen
110	Mon	11-12	B51 Hildebrand	Jessica
111	Mon	1-2	4 Evans	Christine
112	Wed	8-9	255 Dwinelle	Celia
113	Wed	9-10	205 Dwinelle	Ellen
114	Wed	10-11	202 Wheeler	Adam
115	Wed	11-12	242 Hearst Gym	Shawn
116	Wed	2-3	30 Wheeler	Daniel
117	Wed	3-4	254 Dwinelle	Shawn
118	Thu	10-11	2 Evans	Christine
119	Thu	2-3	30 Wheeler	Celia
120	Thu	3-4	83 Dwinelle	Shawn
121	Fri	9-10	70 Evans	Celia
122	Fri	10-11	136 Barrows	Christine
123	Fri	11-12	179 Stanley	Jessica
124	Fri	12-1	179 Stanley	Sylvia

**Prerequisites:** A passion to learn! There are no University course prerequisites for this class. The subject matter is of interest to both non-science and science majors, and the course has its foundations in both conventional science and in poetry, broadly defined. The class is a College of Letters & Science Discovery Course, which speaks to the nature and breadth of the course.

**Concerning the *Pharmako* texts:** The *Pharmako* trilogy addresses the topic of psychoactive drugs via chemistry, botany, psychology, history, and poetry. The author, Dale Pendell (1947-2018), was an outstanding poet and a very knowledgeable ethnobotanist. Reading these books will give you a perspective on psychoactive plants and drugs unlike any other material ever written on these subjects. The books are published by North Atlantic in Berkeley, are relatively inexpensive and, in my opinion, are works of art that one can come back to over and over again. I have read each of them multiple times and, like all good poetry, every time I read from them I appreciate new things. The current editions (2010) each have 4-5 pages of "supplemental notes" appended to the end, containing additional information that the author found particularly relevant to the subject. Other than these supplemental notes, the books are identical to earlier editions. The three books were originally published in 1995 (*Poeia*), 2002 (*Dynamis*), and 2005 (*Gnosis*) by Mercury House, and then, in 2009, issued in hardcover editions by North Atlantic Books. Any of these editions will do for this class. Works of art do not need to be updated. Beginning with *Pharmako/Poeia* - some of you will love this book. Among students over the years, some have had their lives profoundly changed - for the better - by reading it. Some of you will be unmoved by the book, perhaps puzzled by it. And a few of you may dislike it immensely, questioning the sanity of its selection as the text for this class. Everyone should begin by reading the book's foreword (pp. xiii-xiv) by the poet Gary Snyder - he states it clearly: "This is a book about danger: dangerous knowledge, even more dangerous ignorance. . . . I hope and believe it will benefit human beings and the plant world too. It is not for everyone - but neither is mountaineering."

**Please read this syllabus carefully. We have worked to make it comprehensive and address most questions that might arise.**

Attendance at the lectures and in discussion section is required. While the factual content in the course can be learned by reading and obtaining notes from the lectures, we believe there are very important elements of the material that are best, if not exclusively, transmitted through in-person contact. True learning is more than memorizing facts, even though knowing facts is also an important part of the process.

**Use of Electronics in Class:** Use of laptop computers, tablets, or other screen devices in class is not allowed, except in a designated area of the room. Research studies consistently demonstrate that use of screen devices during lectures detracts from learning on the part of the user and also, importantly, has a negative impact on those in the vicinity of the user. We ask that cell phones be turned off or placed on silent mode at the start of class, and that there be no texting during class.

**Grading:** Your grade in the class is based on exam performance (three midterm exams) (~ 75-80% of your grade) and discussion section assignments (~ 20-25% of your grade). The discussion-section assignment portion of your grade comes from the written homework assignments and participation in oral-group debates. The exact % contributions of the various exams and assignments will be determined at the end of the semester. We do not indicate the exact % contributions of the grade components at the beginning of the semester because we wish to discourage the running computation of points and accompanying preoccupation with how well one is doing in the class. The GSIs and I do not wish to hear questions of the form: "How well do I need to do on the next exam in order to get an 'A' in the class?" Our answer to any questions of this sort will always be: "Do as well as you can on all exams and assignments!" The task is to enjoy learning the material; the assignments and exams will hopefully assist with this.

**If you are taking this class for a letter grade, you cannot earn better than a "C-" grade without receiving credit for ALL of the homework assignments and participating on a debate team. If you are taking this class pass/not-pass, you must turn in ALL of the homework and participate on a debate team in order to pass the class. The homework and debate assignments are required in this way because we believe them to be an important component of the learning in this class.**

Your letter grade in the course will be determined according to absolute standards of performance. This hopefully relates to your acquisition of knowledge and understanding of the material. Importantly, you will not be competing against fellow students in the sense that **we do not force letter grades to conform to a predetermined distribution; this is another way of saying that we do not "grade on a curve."** If everyone does extremely well, everyone could receive an "A" grade. If everyone does poorly (highly unlikely, as this has never happened), then everyone could get a low grade. Rather than devoting energy to worrying about letter-grade cut-offs, if you are truly interested in this subject and in getting the most from this class, we urge you to study seriously from the beginning, attend class meetings, do the readings, and truly make an effort to learn the material. You will be rewarded with knowledge and understanding of some really fascinating topics. Good grades will be a natural side effect.

In past years the percentage of students earning an "A" or a "B" in this class has been between 60 and 70%. Thus, the majority of students do well in this class. However, in order to do well in the class you do need to learn a bunch of stuff. It is also easy to get a "C" or even lower grade in the class, if you don't put in sufficient effort. Most students do not consider this class to be "an easy A."

Do not make the mistake of not keeping up with the material and then trying to negotiate a last-minute deal to improve your grade. On the bCourses website (in Files: Background) there are some examples (Emails to Avoid) of desperate emails I have received in past years. It is very sad. We recommend that you not get yourself into the position of needing to write such emails. We do not offer extra credit or

make other arrangements to boost grades. If you want a good grade, you must learn the course material in a timely manner. It's as simple as that.

**Exams** will consist of multiple-choice and short-answer questions. Each midterm exam covers the preceding portion of the course and draws from material in lectures, discussion sections, and required readings. A sampling of questions from past exams is on bCourses (in Files: Background).

- **Midterm Exam One** is on **Tuesday September 25** at 11:00 AM in Wheeler Auditorium
  - **Midterm Exam Two** is on **Thursday October 25** at 11:00 AM in Wheeler Auditorium
  - **Midterm Exam Three** is on **Thursday November 29** at 11:00 AM in Wheeler Auditorium
- There will NOT be a cumulative final exam in this class.**
- we cannot change the days and times for these exams; mark your calendars now
  - there will be no make-up exams
    - if you miss an exam, you will receive zero points for that exam
    - if you miss one of the first two midterm exams with a credible excuse (e.g., significant medical problem or emergency, documented with verifiable documentation that is presented in **person during office hours** to the professor), then your other exams will count proportionally more in determining your course grade
    - if you miss the third midterm exam with a credible excuse, you will receive an incomplete (I) grade for the course (provided you have passing status in the class prior to the exam, otherwise grade = F); you will need to resolve the incomplete grade by taking a special exam, and it may be necessary to wait until the next time the class is given to resolve the incomplete grade
    - in case of a missed exam due to a credible excuse, one must arrange to **meet with the professor in person and supply verifiable documentation as to why the exam was missed**. This must be done as soon as possible after the exam. Failure to do this will result in zero points for the missed exam.

#### **Homework:**

- detailed instructions are posted on bCourses in Files: Homework Assignments.
  - **Homework One** is a description and analysis of an article you find from the current news media
    - due in discussion section the week of **September 4-7 (Monday sections due on Sept 10)**
  - **Homework Two** is a short essay related to reading in *Pharmako/Poeia*
    - due in discussion section the week of **September 24-28**
  - **Homework Three** is about plant rituals in your life
    - due in discussion section the week of **October 8-12**
  - **Homework Four** is a short essay related to reading in *Pharmako/Poeia*
    - due in discussion section the week of **October 22-26**
  - **Homework Five** is about the topic of your topical essay (Homework Six)
    - due in discussion section the week of **October 29 - November 2**
  - **Homework Six** is an essay written on a topic of your choice
    - due in discussion section the week of **November 13-16 (Monday sections due on Nov 19)**
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- **Homework assignments must be turned in as paper copy in discussion section.**
  - **Emailed assignments will not be accepted.**
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- Assignments turned in up to one week after the due date will receive half-credit. Assignments turned in 1-2 weeks after the due date will receive zero points but will be credited as being turned in. Assignments received more than 2 weeks late may not be accepted. Note that this becomes a serious matter, since you need to receive credit for all of the homework assignments in order to receive better than a C- grade (for a letter grade) or a passing grade (for a P/NP grade) in the class. Thus,

be sure to complete your homework on time. This is not an arbitrary rule, but is done to encourage completion of the homework in the way that we believe to be most useful.

- Homework assignments are meant to be interesting, informative, and enjoyable!

**Debates:**

- three debates take place in discussion section; one-third of the class is involved in each of the debates
- **Debate One:** week of **September 10-14 (Monday sections have debate on 9/17, rather than 9/10)**
- **Debate Two:** week of **October 1-5**
- **Debate Three:** week of **November 5-9**
  
- for one of the debates you will be graded on your participation as part of a debate team; for the other two debates you will be graded on participation in the class discussion
- we do our best to choose topics that will make for very interesting debates, where strong arguments can be made for both sides of the issue
- if you have an idea for an interesting debate topic, please let us know

**Getting the most from the class AND preparing to do well on the exams:**

Keep up with the lecture material, readings, homework, and debate preparation. As a guide to studying for exams, we will provide a regularly updated list of Key Concepts from lectures. Review these Key Concepts and use them as a framework for creating your own expanded study outline / study guide. If you know all the Key Concepts, you will do well on the exams. Review the Key Concepts, look up what you don't understand - in your notes, in the readings, in the books, and on the internet (e.g., Wikipedia is often pretty good). Talk with your classmates. Come to discussion section and office hours with any questions on things needing clarification. Repeat throughout the semester. It's really a pretty simple recipe for success.

**Honor Code:** The student community at UC Berkeley has adopted the following Honor Code:  
"As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others."  
The hope and expectation is that you will adhere to this code.

**Collaboration and Independence:** Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do with fellow students. This is recommended. However, unless otherwise instructed, homework assignments are to be completed independently and materials submitted as homework should be the result of one's own independent work.

**Cheating:** A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating. Anyone caught cheating on a quiz or exam in this course will receive a failing grade in the course and will also be reported to the University Center for Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.

**Plagiarism:** Your homework essays must be original writing composed by you. To copy text or ideas from another source without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. The originality of your essays may be checked against the entire worldwide web and additional databases of written material (see [www.turnitin.com](http://www.turnitin.com) for more information on this process). For additional information on plagiarism and how to avoid it, see: <http://gsi.berkeley.edu/teachingguide/misconduct/prevent-plag.html>

**Academic Integrity and Ethics:** Cheating on exams and plagiarism are two examples of dishonest, unethical behavior. Honesty and integrity are of great importance in all facets of life. They help to build a sense of self-confidence, and are key to building trust within relationships, whether personal or

professional. There is no tolerance for dishonesty in the academic world, for it undermines what we are dedicated to doing - furthering knowledge for the benefit of humanity.

Your experience as a student at UC Berkeley is hopefully fueled by passion for learning and replete with fulfilling activities. And we also appreciate that being a student can be stressful. There may be times when there is temptation to engage in some kind of cheating in order to improve a grade or otherwise advance your career. This could be as blatant as having someone else sit for you in an exam, or submitting a written assignment that has been copied from another source. And it could be as subtle as glancing at a fellow student's exam when you are unsure of an answer to a question and are looking for some confirmation. One might do any of these things and potentially not get caught. However, if you cheat, no matter how much you may have learned in this class, you have failed to learn the most important lesson of all.

**Communication and Emails:** We like teaching this class! The material is fascinating and, we believe, useful and important to know about. I enjoy being available during office hours and after lectures to answer questions and further discuss the material. I strongly prefer in-person contact to email. **Questions of importance or ones that require detailed answers must be addressed in person.** In most circumstances, I am unlikely to respond to emailed questions. **Always make sure to see me in person about any important matter.** It will never be an acceptable excuse to say something like: "Well, I sent you an email and never heard back." **As stated: Always make sure to see me in person about any important matter.** Email is a wonderful tool and very convenient. However, it is not a substitute for direct personal contact, especially when such contact is easy, as it is with me.

Thanks again for your interest in this subject. We truly hope you have a very enjoyable and fulfilling experience in this class this semester!

• University holidays: No discussion sections or lectures on these days:

Monday, September 3 - Labor Day, remember and honor the workers of the world

Monday, November 12 - Veterans Day (11/11), remember and honor the military veterans of the world

Wednesday, November 21 - University "non-instruction day" - prelude to giving thanks

Thursday, November 22 - Thanksgiving Day, give thanks

Friday, November 23 - day after Thanksgiving Day, continue giving thanks

• Important astronomical dates and days of ancient ritual:

New Moons: August 11, September 9, October 8, November 7, December 6

Full Moons: August 26, September 24, October 24, November 22, December 22

Autumn Equinox: September 22

Halloween / Samhain: October 31

Winter Solstice: December 21



Approximate course timeline of topics, with corresponding reading from *Pharmako/Poeia* indicated by page numbers; additional readings and lecture supplements posted on bCourses.

<b>Week 1:</b> 22-24 Aug	Course logistics and overview. Drugs, poisons, plant medicines, allies, curanderos, abuse, addiction. ( <i>Poeia</i> 1-27).
<b>Week 2:</b> 27-31 Aug	How drugs enter the body and the brain. Nervous system, brain, cells, molecules, membranes.
<b>Week 3:</b> 4-7 Sept	Neurons, synapse, neurotransmitters, receptors, pharmacology, autonomic nervous system, alkaloids, hallucinogenic solanaceous plants. ( <i>Poeia</i> 29-30). <b>Homework 1.</b>
<b>Week 4:</b> 10-14 Sept	Tobacco and nicotine. ( <i>Poeia</i> 31-50). <b>Debate One</b> in discussion section.
<b>Week 5:</b> 17-21 Sept	Alcohol, fermentation, distillation, toxicities, pharmacology. ( <i>Poeia</i> 51-82; 93-97).
<b>Week 6:</b> 24-28 Sept	<b>Midterm Exam One</b> on Tuesday September 25. Inhalants, general anesthetics. ( <i>Poeia</i> 83-92). Pharmaceutical sedative-hypnotics. <b>Homework 2.</b>
<b>Week 7:</b> 1-5 Oct	Absinthe, thujone. ( <i>Poeia</i> 99-113). Drug law history, controlled substances and schedules. <b>Debate Two</b> in discussion section.
<b>Week 8:</b> 8-12 Oct	Cannabis. ( <i>Poeia</i> 177-225). <b>Homework 3.</b>
<b>Week 9:</b> 15-19 Oct	Opium, opioids, and endorphins. ( <i>Poeia</i> 117-143). Caffeine, tea, coffee.
<b>Week 10:</b> 22-26 Oct	Coffee, cacao, chocolate, kola. <b>Midterm Exam Two</b> on Thursday October 25. <b>Homework 4.</b>
<b>Week 11:</b> 29 Oct - 2 Nov	Ephedra, khat, amphetamine. Coca and cocaine. <b>Homework 5.</b>
<b>Week 12:</b> 5-9 Nov	Addiction and treatment. <b>Debate Three</b> in discussion section (Friday section Debate on 11/3).
<b>Week 13:</b> 13-16 Nov	Psychedelics, LSD, magic mushrooms, psilocybin. <b>Homework 6.</b>
<b>Week 14:</b> 19-20 Nov	DMT, ayahuasca, peyote, mescaline, MDMA.
<b>Week 15:</b> 26-30 Nov	Nitrous oxide. Brain and mind. <b>Midterm Exam Three</b> on Thursday November 29.