

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 2022

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

Format: Two 80-minute Lectures and one 50-minute Discussion Section meeting each week.

Lecture times: Tuesdays and Thursdays, 2:00 to 3:30 PM, 155 Dwinelle Hall

Instructor: David Presti <presti@berkeley.edu>

Instructor's office hours: To be announced

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 additional 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: Additional course readings, some required and some optional, will be posted throughout the semester on our class bCourses website.

Graduate student instructors (GSIs) and their email addresses:

Yilan Liang <yilan.liang@berkeley.edu>
Naveed Ziari <naveedziari@berkeley.edu>
Kyoko Nagahashi <kyokonagahashi@berkeley.edu>
Jen Holmberg <jenh@berkeley.edu>
Eli Susman <esusman@berkeley.edu>
Dyana Muller <dmuller@berkeley.edu>
Ben Parker <benparker@berkeley.edu>
Allison Nieto <nietoa@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!

Stay in contact with your GSI regarding any and all absences from class.

Discussion Section days, times, locations, and GSIs:

101	Mon	9-10	234 Dwinelle	Naveed
102	Mon	10-11	B1 Hearst Field Annex	Kyoko
103	Mon	11-12	136 Social Sciences Building	Naveed
104	Mon	12-1	105 Latimer	Jen
105	Mon	1-2	83 Dwinelle	Kyoko
106	Mon	2-3	105 Latimer	Jen
107	Mon	3-4	245 Hearst Gym	Dyana
108	Mon	4-5	2066 VLSB	Jen
110	Fri	10-11	2038 VLSB	Yilan
111	Fri	2-3	247 Dwinelle	Allison
113	Wed	9-10	102 Latimer	Allison
114	Wed	10-11	335 Cheit	Dyana
115	Wed	11-12	2030 VLSB	Ben
116	Fri	9-10	2070 VLSB	Allison
117	Wed	1-2	83 Dwinelle	Kyoko
118	Wed	2-3	136 Social Sciences Building	Eli
119	Wed	3-4	228 Dwinelle	Naveed
120	Wed	4-5	130 Dwinelle	Yilan
121	Fri	11-12	3 Evans	Ben
122	Fri	1-2	20 Wheeler	Ben
123	Fri	12-1	2066 VLSB	Yilan

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 botany, history, chemistry, psychology, 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 Books in Berkeley, are relatively inexpensive, and in my opinion, are works of art that one can return to repeatedly. I have read each of them multiple times and, like all good poetry, every time I return something new emerges. The current editions (2010) each have 4-5 pages of "supplemental notes" appended to the end, containing additional information that the author found relevant to updating the subject. Other than these supplemental notes, all editions are identical. The three books were originally published in 1995 (*Poeia*), 2002 (*Dynamis*), and 2005 (*Gnosis*) by Mercury House in San Francisco. In 2009, North Atlantic Books issued hardcover editions, followed by paperback editions (with the supplemental notes) in 2010. Any of these editions will do for this class. **Works of art do not need to be updated.** *Pharmako/Poeia* is the only member of this trilogy that is required reading for our class.

Based on using *Pharmako/Poeia* as a text with thousands of UC Berkeley students for more than two decades, I expect that some of you will love this book and connect with its pharmako-poetic approach, perhaps going on to read and enjoy the other two *Pharmako* volumes. Former students, years after they have graduated from UCB, have told me they continue to hold these books dearly. And some of you will have other reactions, ranging from being unmoved, to puzzled, to dislike. Such are the ways of works of art.

Everyone should begin by reading *Pharmako/Poeia's* Foreword (pp. xiii-xiv) by poet Gary Snyder, wherein he states the issue 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. The syllabus is also an evolving document and there may be changes implemented (and announced) at various points during the semester.

We expect to record the lectures and post audiovisual recordings on our class website. Discussion section meetings will not be recorded. Attendance at discussion sections is required. And attendance at lectures is strongly recommended, although we are not monitoring attendance at lectures. While the factual content in the course can be learned by reading, obtaining notes, and viewing and listening to recordings, 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.

Recordings and other course materials: Recorded lecture materials (audiovisual and graphic) and other materials created for instructional use in this class are proprietary and **not meant for distribution beyond our class.** We ask that you not further distribute any of these materials, including posting or streaming online in any manner. There is a UC Berkeley policy statement that directly addresses this:
<https://sa.berkeley.edu/classroom-note-taking-and-recording-policy>

In this era where it is often assumed that freely sharing anything and everything online is okay, and is actually the stated mission of so much material (e.g., social media posts made with the expressed hope of wide distribution, regardless of their accuracy or value toward serving the greater good), it is important to appreciate that this is not the case for materials on bCourses, which is a closed website access to which is available only to students enrolled in our class.

Use of Electronics in Class: Use in class of laptop computers, tablets, or other screen devices should be done thoughtfully, with knowledge of and attention to the impact of these devices on learning, for both oneself and one's neighbors. Research studies consistently demonstrate that use of screen devices during lectures (even for taking notes) detracts from learning on the part of the user and also, very importantly, has a negative impact on those in the vicinity of the user. Please be respectful of this. We also ask that cell phones kindly be placed on silent mode or turned off at the start of class, and that there be no texting during class.

Grading: Your grade in the class is based on exam performance (two midterms and a final exam) (~70% of your grade) and discussion-section assignments (~30% of your grade). The discussion-section portion of your grade comes from the written homework assignments and participation in two oral-group debates. For one of the debates you will be graded on your participation as part of a debate team; for the other debate you will be graded on participation in the class discussion. The exact % contributions of the various exams and assignments will be determined later in 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 numerically 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!" Our hope is you will enjoy your study of the material; the assignments and exams are meant to 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 in the debates. If you are taking this class

P/NP, you must receive credit for ALL of the homework and participate in the debates 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 educational experience 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 we do not "grade on a curve."** If everyone does extremely well, everyone could receive an "A" grade. If everyone does poorly (highly unlikely), 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 discussion-section meetings, visit office hours, 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 typically been between 60 and 70%. Thus, the majority of students do well in this class. However, in order to do well, you do need to demonstrate participation and understanding. 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 our course website (in Files: Course Information) there are some examples (Emails to Avoid) of desperate emails I have received in past years. Please read this document. It is very sad. We recommend that you not get yourself into the position of needing to write such emails.

Please note that we do NOT make deals to improve grades, neither at the end of the semester nor anytime during. Specifically, we do not offer individual students extra-credit assignments or other activities to boost grades. To do so would be unfair to the rest of the class. If there is ever an "extra-credit" assignment, it would be announced to the entire class and made available to everyone. (For example, occasionally we have had extra-credit questions on exams.)

We repeat, the grading in this class is such that it is possible to get a good grade if you study and learn the material. However, you do need to engage and work. If you are having problems, it is important to ask questions of clarification early in the semester, attend office hours, connect with all available study resources, develop new study strategies, etc. Near the end of the semester, or after the end, is too late.

Exams will consist of multiple-choice, short-answer, and longer-answer essay-type questions. Exams will be administered online and will be "open book," in that you may refer to your book and notes in taking the exam. Just as for an exam administered in the classroom, the online exams will be timed, meaning you will have a specific length of time (probably 80 minutes, as for an in-classroom midterm exam, and possibly longer for the final) in which to complete the exam. The exam will be administered during our usual class meeting time, although you may take it from anywhere. We may have a time-window cushion (of an additional hour or so) enclosing the class meeting time within which you may take the 80-minute exam; we have not determined this yet.

Exams will draw upon material presented in lectures, material from the book, and other reading material (designated as required) posted on our website. Each midterm exam covers the preceding portion of the course and draws from material in lectures, discussion sections, and readings. The final exam is comprehensive and covers material from the entire semester. Key Concept study guides will be posted on our website and regularly updated to assist in identifying material from the lectures and book that we feel are essential concepts. Review sessions will also be conducted prior to exams. There will be no surprises or trick questions. Our desire is for you to learn the material and do well on the exams!

- **Midterm Exam One is on Tuesday October 11, during lecture time**
- **Midterm Exam Two is on Thursday December 1, during lecture time**
- **Final Exam is on Tuesday December 13, from 8 to 11 AM**
- 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 midterm exams with a credible excuse (e.g., significant medical problem or emergency, documented with verifiable documentation presented in person) then your other exams will count proportionally more in determining your course grade.
- if you miss the final exam with a documented credible excuse, you will receive an incomplete 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 offered to resolve the incomplete grade. We do not recommend this, as it is our experience that students have a great difficulty in resolving incomplete grades, and they tend to only contribute to increased stress and anxiety going into the future.
- in case of a missed exam due to a credible excuse, **one must inform both your GSI and me (David Presti) as soon as you are able following a missed exam. Failure to do this within 48 hours will result in zero points for the missed exam and no subsequent adjustment by using other exam scores.** In addition, one must arrange to **meet with me (David Presti) 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 in Files: Homework.

- **Homework One** is a description and analysis of an article you find from the current news media
 - due in Discussion Section during the week of **September 6-9**
 - Monday Section students due on September 12, because of Labor Day Holiday on 9/5
- **Homework Two** is a reflection essay related to reading in *Pharmako/Poeia*
 - due in Discussion Section during the week of **September 12-16**
- **Homework Three** is about ritual relationships with plants
 - due in Discussion Section during the week of **October 10-14**
- **Homework Four** is a reflection essay related to reading in *Pharmako/Poeia*
 - due in Discussion Section during the week of **October 17-21**
- **Homework Five** is about the topic of your topical essay (Homework Six)
 - due in Discussion Section during the week of **October 24-28**
- **Homework Six** is an essay written on a topic of your choice
 - due in Discussion Section during the week of **November 14-18**
- **Homework assignments must be turned in as paper copy in discussion section.**
- **Emailed assignments will not be accepted.**
- Assignments submitted up to one week after the due date will receive half-credit. Assignments submitted more than one week after the due date will receive zero points but will be credited as being turned in. Note that all homework needs to be completed and turned in in to receive better than a C- grade (for a letter grade) or a passing grade (for a P/NP grade) in the class.
- Homework assignments are meant to contribute substantially to the learning trajectory of the class, and to be interesting, informative, and enjoyable as well.

Discussion-section debates: There will be two participatory debates taking place during Discussion Sections. Details of the debate format are posted in Files: Debate. The debates will take place during the week of September 26 to 30 and the week of November 7 to 11 (Friday 11/11 Sections will hold their Debate the previous week, on 11/4). Debate Topics will be decided as the semester progresses. We endeavor to develop debate topics that are relevant and timely, and for which strong arguments can be made for both sides.

Getting the most from the class AND preparing to do well on the exams: Keep up with the lecture material, readings, and homework. As a guide to preparing for exams, we will post a regularly updated list of Key Concepts from lectures. Review the Key Concepts, look up what you don't understand — in your notes, in the readings, and on the internet (e.g., Wikipedia is often a pretty good source of information for many of the topics in this class). Use the Key Concepts as a framework for creating your own expanded study outline / study guide. Come to Discussion Sections 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 students at UC Berkeley have adopted the following Honor Code:
"As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others."
The 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. Exams are also to be taken without communication with other students, or using sources of information other than your own book and notes.

Cheating: Anyone caught cheating on an assignment 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. A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating.

Plagiarism: Your homework essays must be original writing composed by you. Copying 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 as well. The originality of your essays may be checked against the entire worldwide web and additional databases of written material. 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 take an exam in your place, 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 (of course, this refers to the usual in-person scenario). 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.

Mental Health and Wellness: All students — regardless of background or identity — may experience a range of issues that can become barriers to learning. These issues include, but are not limited to, strained relationships, anxiety, depression, alcohol and other drug problems, difficulties with concentration, sleep, and eating, and/or lack of motivation. Such mental health concerns can diminish both academic performance and the capacity to participate in daily activities. In the event that you need mental health support, or are concerned about a friend, UC Berkeley offers many services, such as free short-term counseling at University Health Services.

An excellent campus website having links to many resources is: <http://recalibrate.berkeley.edu/>
Another website addressing campus mental health services and with specific reference to this time of the continuing coronavirus pandemic is: <https://uhs.berkeley.edu/coronavirus/student-mental-health>

Remember that seeking help is a good and courageous thing to do — both for yourself and for those who care about you.

Communication and Emails: We like teaching this class! The material is fascinating and, we believe, useful and important to know. 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 emails. **Always make sure to see me in person about any important matter.** It will never be an acceptable excuse to say something like: "I sent you an email and never heard back." **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. The GSIs and I are excited about being together with you this semester, for what we hope to be an enjoyable and fulfilling adventure in learning!

- University holidays: No lectures or discussion sections on these days:
 - Monday, September 5 - Labor Day, remember and honor the workers of the world
 - Friday, November 11 - Veterans Day, remember and honor the military veterans of the world
 - Wednesday, November 23 - University "non-instruction day" - prelude to giving thanks
 - Thursday, November 25 - Thanksgiving Day, give thanks
 - Friday, November 25 - day after Thanksgiving Day, continue giving thanks
- Important astronomical dates and days of ancient ritual:

New Moons:	August 27, September 25, October 25, November 23, December 23
Full Moons:	August 11, September 10, October 9, November 8, December 7
Autumn Equinox:	Thursday, September 22
Samhain:	October 31 to November 1
Halloween:	Monday, October 31
Day of the Dead:	Tuesday, November 1
Winter Solstice:	Wednesday, December 21



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

Week 1:	24-26 Aug	Course logistics and overview. Drugs, poisons, plant medicines, allies, medicine people, shamans. (<i>Poeia</i> 1-27).
Week 2:	29 Aug – 2 Sept	How drugs enter the body and the brain. Molecules, membranes, cells, nervous system, brain, neurons, synapses, neurotransmitters, receptors, autonomic nervous system.
Week 3:	6-9 Sept	Solanaceous plant family and its diverse members, alkaloids, hallucinogens, tobacco, nicotine. (<i>Poeia</i> 29-50). (HW 1 due in Section).
Week 4:	12-16 Sept	Tobacco (concluded), prevalence statistics. Areca/betel nut. Alcohol, fermentation, distillation, toxicities. (<i>Poeia</i> 51-82; 93-97). (HW 2 due in Section).
Week 5:	19-23 Sept	Sedative-hypnotic pharmacology, general anesthetics, inhalants, pharmaceutical sedative-hypnotics. (<i>Poeia</i> 83-92). Absinthe, thujone. (<i>Poeia</i> 99-113). Drug law history, controlled substances (CS), and CS schedules.
Week 6:	26-30 Sept	Cannabis. (<i>Poeia</i> 177-225). (Debate 1 in Discussion Section).
Week 7:	3-7 Oct	Opium, opioids, and endorphins. (<i>Poeia</i> 117-143). Caffeine, tea, coffee, cacao, chocolate, kola.
Week 8:	10-14 Oct	Midterm Exam One on Tuesday October 11. Coca and cocaine. (HW3 due in Section).
Week 9:	17-21 Oct	<i>Ephedra</i> , khat, amphetamine. Addiction and treatment. (HW4 due in Section).
Week 10:	24-28 Oct	Psychiatric medications, placebo effects and mind-body medicine. (HW5 due in Section).
Week 11:	31 Oct - 4 Nov	Mind-body medicine, psychedelics introduction and history, LSD.
Week 12:	7-11 Nov	Peyote, mescaline, DMT, ayahuasca, magic mushrooms, psilocybin. (Debate 2 in Discussion Section). (Veterans Day Holiday on 11/11)
Week 13:	14-18 Nov	Synthetic psychedelics, MDMA, clinical research. Psychedelic neuroscience. (HW6 due in Section).
Week 14:	21-25 Nov	Ketamine, nitrous oxide. (Thanksgiving Holiday)
Week 15:	28 Nov-2 Dec	William James, brain, mind, and reality. Midterm Exam Two on Thursday December 1.