BRAIN, MIND, AND BEHAVIOR: AN INTRODUCTION TO NEUROSCIENCE
MCB C61 / PSYCH C61

Department of Molecular and Cell Biology, and Department of Psychology

University of California, Berkeley - Winter-Spring Semester 2018

The human brain is the most complex structure in the known universe. The study of its structure and function and how it figures into our actions and experience is among the most exciting arenas of modern science. This class begins with molecules and cells, builds up to brains and nervous systems, encompasses neural signaling, sensory perception, memory, language, and emotion, and culminates with the great mystery of how brain processes relate to consciousness and mental experience – that is, how mind is related to brain. This is a comprehensive introduction to the exciting subject of contemporary neuroscience, open to all interested students.

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

Lecture times: Tuesday and Thursday at 9:30 to 11:00 a.m. – Wheeler Auditorium

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

Office hours: Tue 2:30-3:15 p.m. and Thu 1:00 to 1:30 p.m. in 249 LSA

Required text: *Foundational Concepts in Neuroscience: A Brain-Mind Odyssey* by David E. Presti (W.W. Norton, 2016)

Other course readings: There will be additional readings posted regularly throughout the semester on our class bCourses website.

Graduate student instructors (GSIs) and their email addresses:

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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. Don't be shy!

Discussion section times, locations, and GSIs:

101	Mon	9-10	209 Dwinelle	Nema
102	Mon	10-11	179 Stanley	Irene
103	Mon	11-12	202 Wheeler	Krisha
104	Mon	12-1	238 Kroeber	Shinya
105	Mon	1-2	2070 VLSB	Jennifer
106	Mon	2-3	2062 VLSB	Krisha
107	Mon	3-4	242 Hearst Gym	Jennifer
108	Tue	3-4	104 Barrows	Shinya
109	Tue	12-1	126 Wheeler	Kurtresha
110	Tue	1-2	224 Wheeler	Irene
111	Tue	2-3	126 Wheeler	Malak
112	Wed	8-9	243 Dwinelle	Jennifer
113	Wed	11-12	3109 Etcheverry	Vasiliki (Villy)
114	Wed	3-4	259 Dwinelle	Julia
115	Wed	4-5	283 Dwinelle	Julia
116	Thu	11-12	126 Wheeler	Malak
117	Thu	12-1	126 Wheeler	Nema
118	Thu	1-2	220 Wheeler	Kurtresha
119	Thu	2-3	24 Wheeler	Vasiliki (Villy)
120	Thu	3-4	2032 VLSB	Vasiliki (Villy)
121	Thu	4-5	283 Dwinelle	Malak
122	Fri	9-10	B56 Hildebrand	Julia
123	Fri	10-11	B56 Hildebrand	Irene
124	Fri	11-12	B56 Hildebrand	Shinya
125	Wed	9-10	109 Dwinelle	Krisha

Prerequisites: A passion to learn! There are no University course prerequisites for this class. Both non-science and science majors are encouraged to enroll.

Please read this syllabus carefully. We have tried to make it comprehensive and address most questions that 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 the use of screen devices during lectures for the most part detract from learning on the part of the user and also, importantly, have 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. No texting during class.

Grading: Your overall grade is based on exam performance (80-85% of your grade) and discussion-section assignments and debates (15-20% of your grade). There are two midterms and a final. The final exam will be longer and cover the entire semester, and will be worth more than a midterm exam (although less than both midterm exams together). The discussion-section portion of your grade comes from written homework assignments and participation in oral-group debates. 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. The exact % contributions of the various exams, quizzes, 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 one's score is in the class. We do not wish to hear questions of the form: "How well do I need to do on the final exam in order to get an 'A' in the class?" Our answer to such questions will always be: Do as well as you can on all exams and assignments! The goal is to enjoy learning the material; the assignments and exams hopefully assist with this.

Although the discussion-section assignments are worth only 15-20% of your grade, it will not be possible to receive higher than a "C-" grade in the class without turning in all of the written homework assignments and participating on a debate team. If you are taking the course P/NP, you must turn in all of the homework and participate in the debate 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 pre-determined 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), then everyone could get a low grade. Rather than devoting energy to worrying about where grade cut-offs are, 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, do the readings, and truly make an effort to learn the material. You will be rewarded with knowledge about 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 generally 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 have 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.

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: Course Information) 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. Hopefully it will be enjoyable.

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. The final exam is comprehensive and covers material from the entire semester. Study guides will be provided and review sessions will be conducted prior to each of the exams. A sampling of questions from past exams is on bCourses (in Files: Course Information). There will be no surprises or trick questions. Our desire is for you to learn the material and do well on the exams.

You are responsible for knowing material presented in lectures, all material from the textbook (whether or not it is covered in lecture), and other required material posted on bCourses. Key Concepts study guides will be posted on bCourses to assist in identifying material from the lectures and textbook that we feel is most important to know.

- Midterm Exam I is **Tuesday February 20** at 9:30 a.m. in Wheeler Auditorium
  - covers material from the Lectures of Jan 17 through Feb 16 and corresponding material from the textbook (approximately chapters 1-8) and any supplementary readings
- Midterm Exam II is **Thursday April 5** at 9:30 a.m. in Wheeler Auditorium
  - covers material from the Lectures of Feb 23 through April 4 and corresponding material from the textbook (approximately chapters 9-17) and any supplementary readings
- Final Exam is **Wednesday May 9** at 11:30 a.m. to 2:30 p.m. (location to be announced)
  - comprehensive and covers material from the entire semester, including all Lectures, all 22 chapters of the textbook, and all supplementary readings

- exams dates will not be changed; 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 a midterm exam with a credible excuse (e.g., significant medical problem documented with verifiable documentation), your final exam score will count proportionally more in determining your course grade. **Written documentation must be presented in-person to me and to your GSI**.
- if you miss the final 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); it may be necessary to wait until the next time the class is given to resolve the incomplete grade

Homework:

- homework assignment 1 - analysis of an article you find from the recent news media
  - due in discussion section the week of **January 29 to February 2**
- homework assignment 2 – writing about consciousness and experience in non-humans
  - due in discussion section the week of **February 5-9**
- homework assignment 3 – critique of popular-media science articles
  - due in discussion section the week of **March 12-16**
- homework assignment 4 - haiku poetry composition about brain, mind, and behavior
  - due in discussion section the week of **April 23-27**
- detailed instructions for the homework will be provided in class and on bCourses in Files: Homework
- homework assignments are to be turned in to your GSI as paper copy, **not e-mailed**
- 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:

- there will be three debates conducted in discussion section, with one-third of the class involved in each of the debates
- the first debate will be during the week **Feb 26-March 2**, the second will be during the week **March 19-23**, and the third will be during the week of **April 16-20**
- debate guidelines and topics (when announced) are posted on bCourses in Files: Debates.
- 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 that could be interesting as a debate topic, please let us know**

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: 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. A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating. For example, 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 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. Additional information on plagiarism and how to avoid it: http://gsi.berkeley.edu/gsi-guide-contents/academic-misconduct-intro/plagiarism/

Academic Integrity and Ethics: Cheating on exams and plagiarism are two common 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.

Safe, Supportive, and Inclusive Environment: Whenever a faculty member, staff member, postdoc, or GSI is responsible for the supervision of a student, a personal relationship between them of a romantic or sexual nature, even if consensual, is against university policy. Any such relationship jeopardizes the integrity of the educational process.

Although faculty and staff can act as excellent resources for students, you should be aware that they are required to report any violations of this campus policy. If you wish to have a confidential discussion on matters related to this policy, you may contact the Confidential Care Advocates on campus for support related to counseling or sensitive issues. Appointments can be made by calling: 510-642-1988.
The classroom, lab, and work place should be safe and inclusive environments for everyone. The Office for the Prevention of Harassment and Discrimination (OPHD) is responsible for ensuring the University provides an environment for faculty, staff and students that is free from discrimination and harassment on the basis of categories including race, color, national origin, age, sex, gender, gender identity, and sexual orientation. Questions or concerns? Call 510-643-7985, email ask_ophd@berkeley.edu, or go to http://survivorsupport.berkeley.edu/

Communication and E-mails: We like teaching this class! The material is fascinating and, we believe, useful and important stuff 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 e-mail 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.** E-mail is a wonderful tool and very convenient. However, it is not a substitute for direct personal contact, especially when such contact is easy.

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 discussion sections or lectures on these days
  - Monday, February 19: honor U.S. presidents, may they continue to be up to the tasks at hand
  - March 26-30: Spring Break – enjoy a well-deserved rest

- Important astronomical dates and days of ancient ritual

New Moons:	January 16, February 15, March 17, April 15, May 15, June 13
Full Moons:	January 1, January 31, March 1, March 31, April 29, May 29, June 27
Vernal Equinox:	March 20
Total Lunar Eclipse:	January 31 (visible in Berkeley, at moonset, in early morning)
Beltane:	May 1
Summer Solstice:	June 21

- lunar and solar information

  Astronomical Applications Department of the US Naval Observatory
  www.usno.navy.mil/USNO/astronomical-applications/
  NASA Eclipse Web Site eclipse.gsfc.nasa.gov/

Approximate timeline of topics, with corresponding chapter readings from the textbook. Additional readings and lecture supplements will be posted on bCourses.

Week 1:	**Jan 16-19**	course logistics; hominin evolution, mind-body problem, nervous systems, brains, neurons (1,2)
Week 2:	**Jan 22-26**	molecules, water, polarity, hydrophilic, hydrophobic, phospholipids, membranes, proteins, chemistry and life (3)
Week 3:	**Jan 29-Feb 2**	DNA backstory, Darwin, Bohr, Delbrück, gene, genetic code, ion channels and pumps, membrane potential, neural signaling (4,5) **Homework One** in Discussion Section.
Week 4:	**Feb 5-9**	synapses, neurotransmitters, ionotropic and GPCR receptors, autonomic nervous system (6,7) **Homework Two** in Discussion Section.
Week 5:	**Feb 12-16**	seizures (7); pharmakon, Na-channel pharmacology, psychoactive drugs (8)
Week 6:	**Feb 19-23**	**Midterm Exam One** on Tuesday Feb 20. (2/19 is Holiday) psychoactive drugs (continued) (9)
Week 7:	**Feb 26-Mar 2**	neural wiring and guidance, neuroplasticity (10) sensory peception, chemotaxis (11) **Debate One** in Discussion Section.
Week 8:	**Mar 5-9**	olfaction, taste, flavor (12,13) vision, retina, photoreceptors, receptive fields, cortical visual areas (14)
Week 9:	**Mar 12-16**	vision (continued) (14); hearing, Fourier analysis, hair cell, vestibular (15) **Homework Three** in Discussion Section.
Week 10:	**Mar 19-23**	somatosensation, motor (16); lesions, brain imaging: x-ray, MRI, EEG, ECoG (17) **Debate Two** in Discussion Section.
---	**Mar 26-30**	**Spring Break**
Week 11:	**Apr 2-6**	brain imaging (continued): MEG, PET, fMRI (17) **Midterm Exam Two** on Thursday April 5
Week 12:	**Apr 9-13**	connectivity, language, meaning, memory (18,19)
Week 13:	**Apr 16-20**	rhythms, sleep, dreams (20); emotion (21) **Debate Three** in Discussion Section.
Week 14:	**Apr 23-27**	consciousness, mind-body problem (22) **Homework Four** in Discussion Section.

This timeline is approximate, and the exact correspondence between topic and date may not be maintained. The order of topics will be preserved, and all topics in the Textbook will be covered.
Best wishes for an enjoyable semester together!