BIPN194/BGGN284: The Neurobiology of Chemical Senses
Winter 2024

Professor: Dr. Chih-Ying Su, e-mail: c8su@ucsd.edu
(Please include BIPN194 in the subject line of any emails concerning the class.)
Location: York Hall 3010
Time: Wednesday, 3:00-4:20 pm
Website: Canvas
Office hours: For presenters, by appointment (Bonner Hall 4402)

Date	Topic	Papers
Jan 10	Introduction by Dr. Su	Review: Su et al., *Cell*, 2009
Jan 17	Odorant receptor gene family	Rodents: Buck and Axel, *Cell*, 1991 Fruitflies: Clyne et al., *Neuron*, 1999
Jan 24	The combinatorial code of olfaction	Rodents: Malnic et al, *Cell*, 1999 Fruitflies: Hallem & Carlson, *Cell*, 2006
Jan 31	Olfactory sensory map	Rodents: Mombaerts et al., *Cell*, 1996 Fruitflies: Wang et al., *Cell*, 2003
Feb 7	Innate olfactory behavior	Rodents: Dewan et al., *Nature*, 2013 Fruitflies: Suh et al, *Nature*, 2004 Semmelhack & Wang, *Nature*, 2009
Feb 14	Human olfaction	Female tears: Agron et al., *PloS Biology*, 2023 Genetic variation: Keller et al., *Nature*, 2007
Feb 21	Taste receptors I (metabotropic)	Bitter taste: Chandrashekar et al., *Cell*, 2000 Sweet & umami taste: Zhao et al., *Cell*, 2003
Feb 28	Taste receptors II (ionotropic)	Sour taste: Tu et al., *Science*, 2018 Ammonium taste: Liang et al., *Nat Commun*, 2023
Mar 6	Water taste	Fruitflies: Cameron et al., *Nature*, 2010 Rodents: Zocchi et al., *Nature Neuroscience*, 2017
Mar 13	Other chemosensory modalities	Hot chilli peppers: Caterina et al., *Nature*, 1997 Mint: Mckemy et al., *Nature*, 2002 Wasabi: Jordt et al., *Nature*, 2004

Note: Research articles are required readings before attending class (weeks 2 to 10). All papers can be accessed through hyperlinks and are available on Canvas.

Course Description:
Animals in their natural environments are immersed in chemicals, such as odors and tastants. These chemicals are rich in information, and animals have evolved sophisticated chemosensory systems to detect and interpret them. The ability to encode the identity and intensity of diverse chemicals can allow an animal to locate and evaluate food sources, thereby permitting survival, to identify mates, promoting reproduction, and to avoid predators, averting death.

This course will discuss the molecular and cellular mechanisms underlying chemical senses. The class will meet once per week to discuss two or three key research articles. The objective is to review landmark discoveries, assess current perspectives in the field, and develop proficiency in critically analyzing scientific papers.

Format:
This is an in-person discussion class. There will not be a hybrid option and class will not be recorded. After the introductory lecture given by Dr. Su, the following classes will involve student-led presentations and discussions focused on primary research literature. Before each class, students are required to provide summaries of the assigned papers in a Q&A format through Canvas. Active participation is mandatory for all students, and they are expected to contribute by speaking and providing feedback during these sessions.

Teaching Philosophy:
This course goes beyond simple comprehension, emphasizing the need for students to understand how to formulate scientific hypotheses, how to design experiments to test these hypotheses, and interpret results accurately. Focused on real-world research in the neurobiology of chemical senses, it involves active engagement, encouraging students to think critically and engage in debates.

Moreover, this course is designed to offer students opportunities to develop the skills necessary for delivering clear and concise scientific presentations.

Prerequisites:
BIPN100 (Mammalian Physiology) or BIPN140 (Cellular Neurobiology) is strongly recommended.

Grade:
We will employ a grading scale as follows: A+ (≥96%), A (91–95%), A- (88–90%), B+ (83–87%), B (82–86%), B- (77–81%), C+ (71–76%), C (66–70%), C- (61–65%), D (≤60%). There is no exam or final report for this class. Your grade will be based on:

1. **Attendance (10%):** Attendance is mandatory, constituting 10% of the total grade (1% per class). Absences require pre-approval from Dr. Su, and documentation such as a doctor's note is necessary.

2. **Paper summaries (40%)**: Students will be evaluated based on their readiness for in-class discussions, which signifies their thorough reading and understanding of the material. By 10 pm on the Tuesday preceding each Wednesday class, students must respond to questions related to the assigned papers. Canvas submissions will be closed at 10 pm on Tuesdays. These summaries contribute to 40% of the total grade (2% each for the 20 papers discussed in this course). Instructions on how to read scientific papers are available on Canvas.

3. **In-class participation (20%):** Active participation in discussions during presentations is mandatory for students. Meeting this requirement involves asking or answering at least one question per paper for each class. Students are encouraged to prepare questions in advance to enhance their engagement in discussions. Students who remain silent will not receive any participation credit for the class (up to 1% per presentation).

4. **Oral presentation (30%):** Each student is expected to present TWO papers throughout the quarter (15% each). Please note that assignments may undergo changes during the add/drop period. We appreciate your flexibility and patience in this regard.

   Each presentation is expected to last 15–20 minutes, allowing ample time for subsequent discussion (5–10 minutes depending on the number of presentations on that day). There should be no more than 12 slides per presentation. If you exceed the allotted time, you will be requested to conclude, and the maximum credit you can attain for the presentation is 7.5% (half of the full credit). Final presentation files in PowerPoint must be uploaded to Canvas by 1 pm on the day of the presentation (Canvas submission will close by 1 pm).

   Presenters are required to schedule a meeting with Dr. Su between Thursday and Monday before their presentation to address any questions about the paper or the presentation. Due to time constraints, presenters are not required to cover every panel from each figure. It is also not necessary to present every figure in the paper.

   Evaluation will consider the overall quality of the presentation, the accurate identification and discussion of key scientific questions and findings, correct interpretation of data, and individual proficiency in responding to questions from both students and the instructor.

   You can find detailed guidelines for delivering oral scientific presentations in the form of a rubric on Canvas. While the rubric is comprehensive, covering aspects beyond the scope of this course, it will serve as a general guide for the evaluation process.

In each presentation, the speaker is expected to cover the following:

1) Background/Introduction
   In this section, you are expected to provide essential background information to help your audience understand the following questions.
   - What are the questions the authors aim to address?
   - Why are these questions important?
   - Which specific tools or methodologies are employed to address the questions?

2) Results
   For each figure or table, explain the purpose and methodology of the experiment within the context of the paper. Describe what the authors found and the implication of the results. When applicable, discuss any reservations or questions you may have about the data. It is mandatory to thoroughly read and comprehend all the data presented in the article, even when the data are not covered in your presentation. Critically, you must provide an explanation for every panel featured on your slide. In other words, do not show anything you do not intend to explain in your presentation.

3) Conclusion and Discussion. Discuss the conclusions of the paper. If applicable, include a model to summarize the findings. You are encouraged to discuss the long-term implication of the study. Authors often speculate about the significance of their findings in the Discussion section, and it is encouraged to discuss any reservations you may have along with the underlying reasons.

Bonus credit (up to 9%): After each presentation, individuals who did not present are encouraged to provide a brief evaluation of the presentation (up to 0.5% per evaluation). Please submit your evaluation by 9 pm on the day of the class. In the evaluation, you will be asked to indicate:

- What aspects of the presentation were effective and well-executed? Conversely, what areas could be improved or have shortcomings?
- Do you have any suggestions to improve the quality of future presentations? Your constructive comments are valuable for enhancing course participation.

Extra credit: If ≥90% of the class completes the end-of-quarter evaluation, everyone will receive an extra 1% added to their total points for the quarter.

OTHER INFORMATION

Academic integrity: Please, do not cheat. Students are required to complete their own work in accordance with the UCSD Policy on Academic Integrity. Academic misconduct encompasses any prohibited and dishonest methods employed to obtain course credit, a higher grade, or avoid a lower grade. Such misconduct misrepresents your true knowledge and abilities, undermining the instructor's ability to accurately assess your performance in the course. Specifically, in this class, the use of generative written language programs, like ChatGPT, is considered cheating. Do not jeopardize your future by engaging in dishonest practices.

Other student resources: During your time at UC San Diego, you may encounter various challenges that can adversely affect your learning experience. These challenges encompass physical illness, housing or food insecurity, strained relationships, loss of motivation, depression, anxiety, high levels of stress, alcohol and drug problems, feelings of sadness, interpersonal or sexual violence, and grief. Such concerns or stressful events can potentially impact your academic performance and your ability to engage in day-to-day activities.

If you are facing challenges related to coursework that are causing significant stress, please reach out to seek support. UC San Diego offers a range of resources for all enrolled students, including:

- Counseling and Psychological Services (858-534-3755 | caps.ucsd.edu)
- Student Health Services (858-534-3300 | studenthealth.ucsd.edu)
- CARE at the Sexual Assault Resource Center (858-534-5793 | care.ucsd.edu)
- The Hub Basic Needs Center (858-246-2632 | basicneeds.ucsd.edu).