Syllabus 2024

1. Introduction to System Neuroscience (01/22).

***For Discussion** (01/29, Paired with L02)*
J. T. Trachtenberg, B. E. Chen, G. W. Knott, G. Feng, J. R. Sanes, E. Welker, and K. Svoboda. Long-term in vivo imaging of experience-dependent synaptic plasticity in adult cortex. *Nature* 420:788-794, 2002.

2. Different forms of memory (Working, explicit, implicit), Role of Hippocampus (HM) and Cerebellum. Morris Watermaze (01/24)

***For Discussion** (01/29)*

N. S. Clayton and A. Dickinson. Episodic-like memory during cache recovery by scrub jays. *Nature* 395:272-274, 1998.

3. Classical conditioning, gill withdrawal in Aplysia, fear conditioning in rats *(01/31)*

***For Discussion** (02/05)*

Mason MJ, Watkins AJ, Wakabayashi J, et al. Connecting model species to nature: predator-induced long-term sensitization in Aplysia californica. *Learn Mem*. 2014;21(8):363-7.

4. Visual System Development of OD columns, orientation tuning, phantom limb (2-DG Image of ODs Image for retinotopy, Optical Imaging, retinal waves, 3-eyed frog) *(02/07)*

***For Discussion** (02/12)*

J. Sharma, A. Angelucci, and M. Sur. Induction of visual orientation modules in the auditory cortex. *Nature* 404 (6780):841-847, 2000.

L. von Melchner, S. L. Pallas, and M. Sur. Visual behaviour mediated by retinal projections directed to the auditory pathway. *Nature* 404:871-876, 2000.

5. Binocular rivalry, Psychophysics and electrophysiology *(02/14)*.

For Discussion (No discussion on 02/19 President's day):

Write a short summary! (assignment)

N. K. Logothetis, D. A. Leopold, and D. L. Sheinberg. What is rivaling during binocular rivalry? *Nature* 380:621-624, 1996.

D. L. Sheinberg, N. K. Logothetis. The role of temporal cortical areas in perceptual organization

Proceedings of the National Academy of Sciences Apr 1997, 94 (7) 3408-3413.

6. Learning in Barn Owls *(02/21)*.

For Discussion (02/26):

E. I. Knudsen. Capacity for plasticity in the adult owl auditory system expanded by juvenile experience. *Science* 279:1531-1533, 1998. (TA will do a quick review)

Y. Gutfreund, W. Zheng, and E. I. Knudsen. Gated visual input to the central auditory system. *Science* 297:1556-1559, 2002.

7. The electric fish (Guest lecturer: Haleh Fotowat, Harvard University) *(02/28)*.

For Discussion (03/04)

Von Der Emde, Gerhard, et al. "Electric fish measure distance in the dark." Nature 395.6705 (1998): 890.

8. Smart Bees *(03/06)*.

For Discussion (03/18):

Alem, S., Perry, C.J., Zhu, X., Loukola, O.J., Ingraham, T., Søvik, E., and Chittka, L. (2016). Associative Mechanisms Allow for Social Learning and Cultural Transmission of String Pulling in an Insect. PLoS Biol. 14, 1–28.

Srinivasan, M. V., Zhang, S., Altwein, M., and Tautz, J. (2000). Honeybee navigation: Nature and calibration of the "odometer." Science (80-.). 287, 851–853. (this would be the recap of the lecture)

9. Operant conditioning - reward learning (Guest lecturer: Nao Uchida, Harvard University) *(03/20)*.

For Discussion (03/25):

Cohen, J. Y., Haesler, S., Vong, L., Lowell, B. B., and Uchida, N. (2012). Neuron-type-specific signals for reward and punishment in the ventral tegmental area. *Nature* 482, 85–88. doi:10.1038/nature10754.

Brembs, B., Lorenzetti, F. D., Reyes, F. D., Baxter, D. A., and Byrne, J. H. (2002). Operant reward learning in Aplysia: neuronal correlates and mechanisms. *Science* (80-.). 296, 1706–1709. doi:10.1126/science.1069434. *(We decide later whether we keep this or not)*

10. Navigation in Ants *(03/27)*

For Discussion (04/01):

Wittlinger, M., Wehner, R., and Wolf, H. (2006). The ant odometer: Stepping on stilts and stumps. Science (80-.). 312, 1965–1967.

Wohlgemuth, S., Ronacher, B., and Wehner, R. (2001). Ant odometry in the third dimension. Nature 411, 795–798.

11. Motor control and sequence generation (Guest lecturer: Bence Olveczky, Harvard University) *(04/03)*

For Discussion (04/08):

Otchy, T.M., Wolff, S.B.E., Rhee, J.Y., Pehlevan, C., Kawai, R., Kempf, A., Gobes, S.M.H., and Ölveczky, B.P. (2015). Acute off-target effects of neural circuit manipulations. Nature 528, 358–363.

12. Reafference, Forward Models, Inverse Models *(04/10)*

For Discussion (04/15):

Ahrens, M.B., Li, J.M., Orger, M.B., Robson, D.N., Schier, A.F., Engert, F., and Portugues, R. (2012). Brain-wide neuronal dynamics during motor adaptation in zebrafish. Nature 485, 471–477

13. Cognition – Neglects - Wilder Penfield, Broca, Wernicke *(04/17)*.

No section