Questions to guide your reading – Week 5

Paper 1. Hindmarsh Sten et al. “Sexual arousal gates visual processing during Drosophila courtship.” *Nature*. 2021

Q1: What do the authors show that P1 neural activity correlates with in terms of fly behavioral state?

Q2: What visual features do LC10a neurons respond to? How do these features relate to what a male fly sees during courtship?

Q3: What do flies do when you optogenetically activate LC10a neurons?

Q4: How does the response amplitude of LC10a visual neurons change as a function of P1 activity?

Q5: Explain the components of the simple network model the authors use to predict fly responses to oscillating moving spots. How does it improve when the authors include a model of P1 neural activity?

Q6: When and how might it be useful to have an equivalent to “P1 neurons” in robotic control algorithms?

Paper 2. Cazalé-Debat et al. “Mating proximity blinds threat perception.” *Nature.* 2024

Q1: What do the authors mean by ‘love blinness’? How is it experimentally shown in flies?

Q2: Which two tools did the authors use to show that LC16 visual neurons and 5-HT (TRH^{R23E12} serotonergic) neurons are important for stopping courtship in the presence of a threat?

Q3: Which two central courtship nodes are inhibited by Serotonergic neurons?

Q4: What is the full model of how threats inhibit courtship during early courtship stages?

Q5: Which late-stage courtship behavior causes males to ignore threatening cues? What evidence suggests that this is causing the ignoring (causal evidence) as opposed to simply correlated with ignoring?

Q6: How does dopamine activity reflect courtship stage? What behavior appears to drive these dopamine activity dynamics? How does this dopamine signal block visual threat detection?

Q7: Summarize the full block diagram of how 5-HT and dopamine influence the decision of whether to court or abort courtship in the presence of a threat.

Q8: The authors discuss the common importance of D2-like dopamine receptors across species. Recount these and what general role the authors feel dopamine may play in action selection.