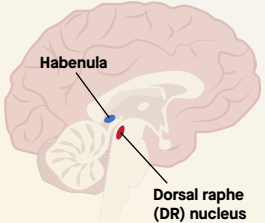
Computational modeling of light processing in the habenula and dorsal raphe

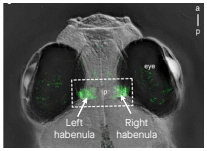
The **habenula** plays a central role in mood disorders and light processing by the brain



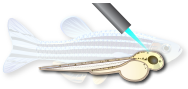
But its functional connectivity with the downstream **DR nucleus**, which also helps regulate brain state in response to light, has been incompletely characterized

Relationship betwen the habenula and DR in zebrafish larvae

Calcium imaging



Lesioning of different cell types via two-photon laser ablation

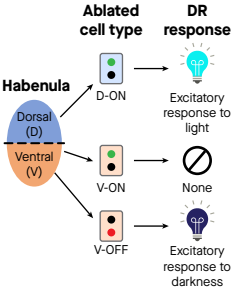


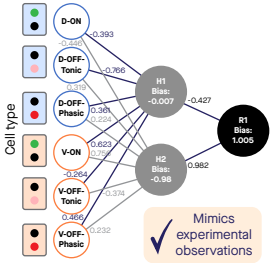
Empirical data employed to simulate DR response

Two-layer feed forward neural network model

Identified neuronal subtypes:

- Excited by light (**ON**)
- Excited by subsequent darkness followed by gradual decrease (**tonic OFF**)
- Excited by subsequent darkness in the form of a sharply spiked response (**phasic OFF**)





Simple computational models that mimic empirical observations could facilitate future experiments and improve our understanding of human psychiatric disorders