

Connectome based theory in Drosophila

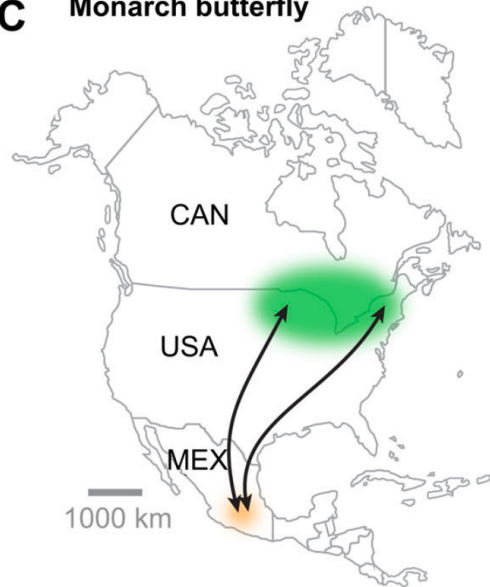
Brabeeba Wang

05/02/2023

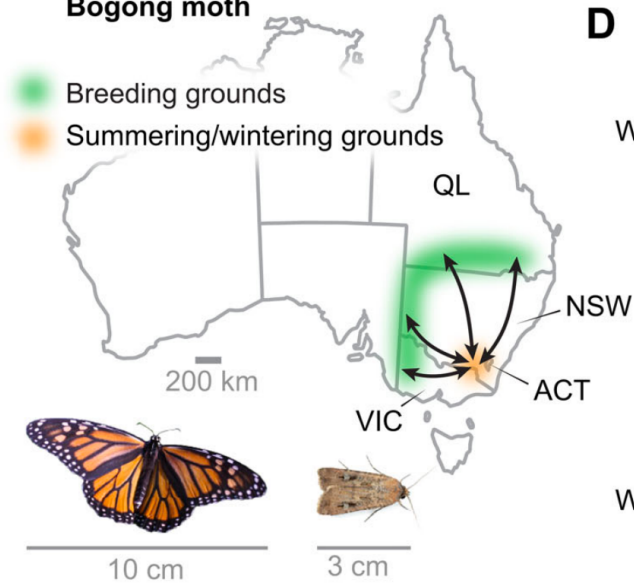
How does connectome inspire theory?

- Behaviors (computational goal)
- Connectome (biological prior)
- Functional electrophysiology (neural representation)
- => Theory

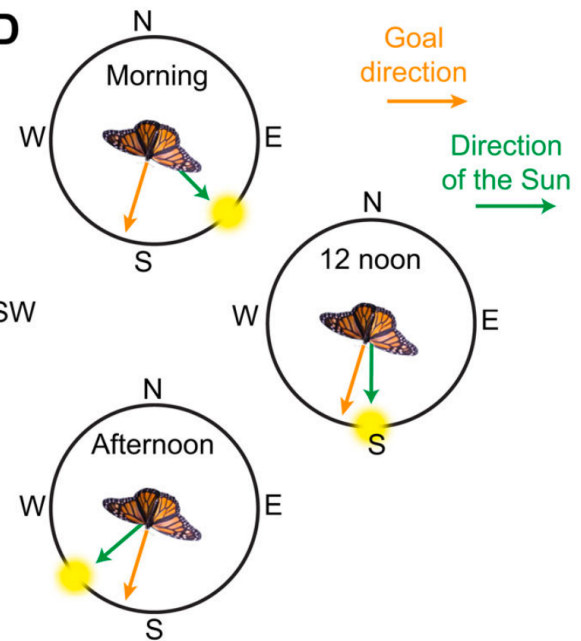
C Monarch butterfly



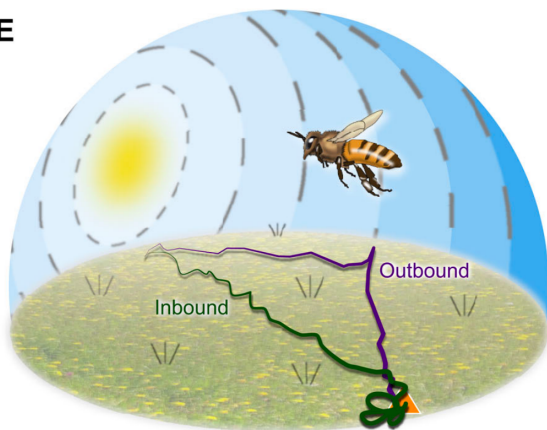
Bogong moth



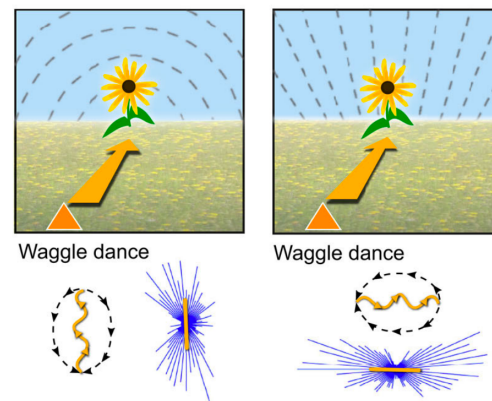
D

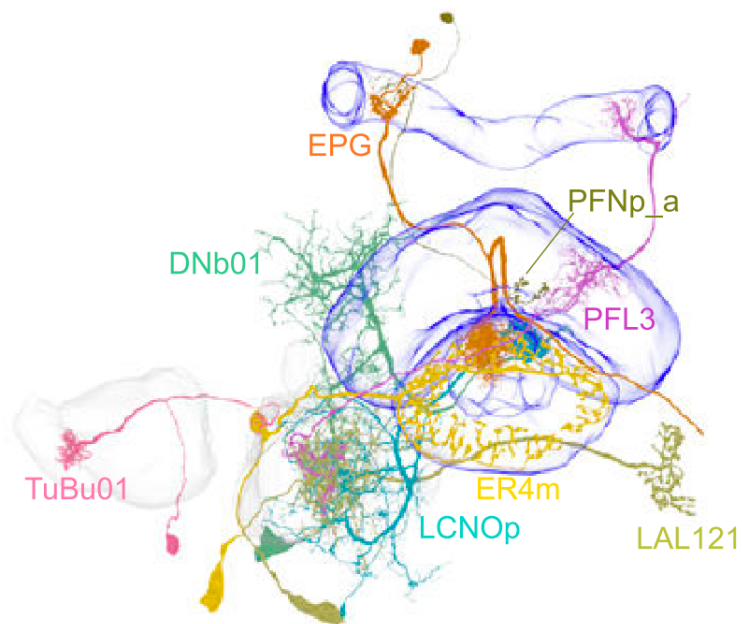
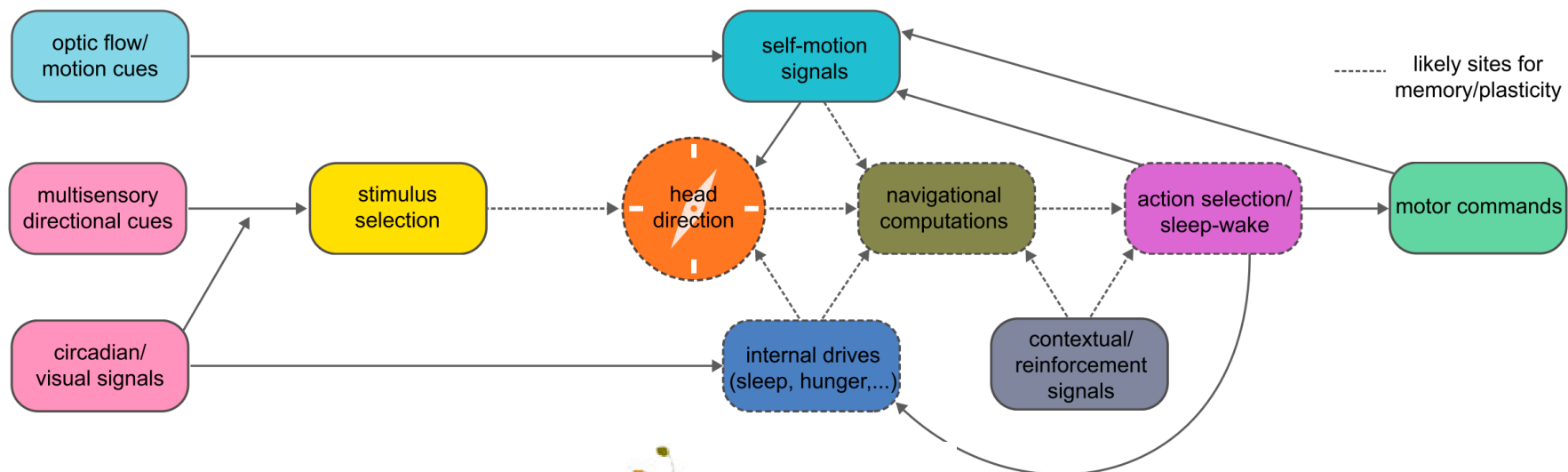


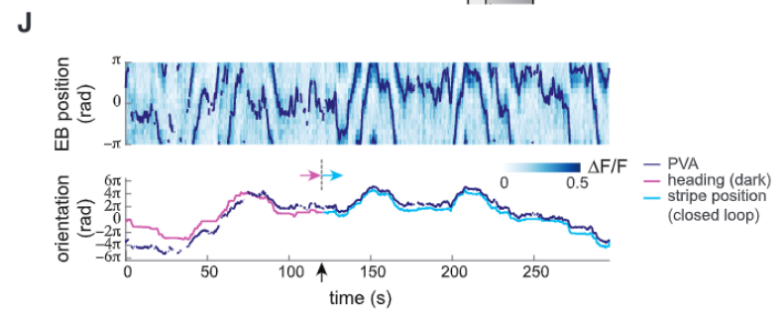
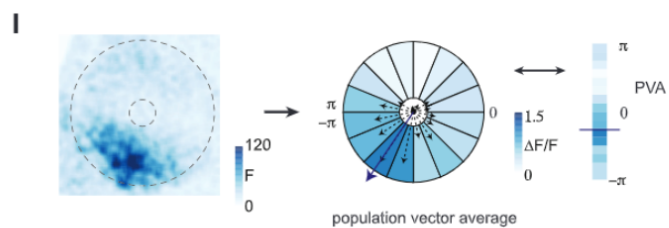
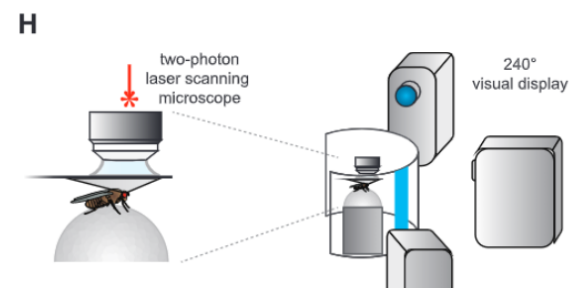
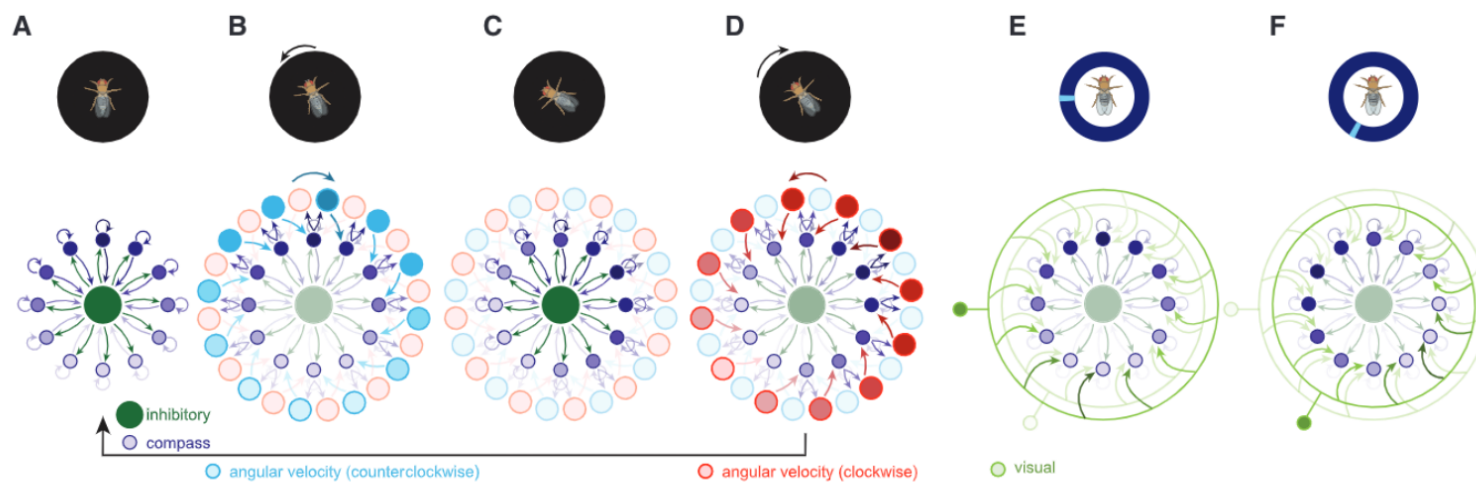
E



F

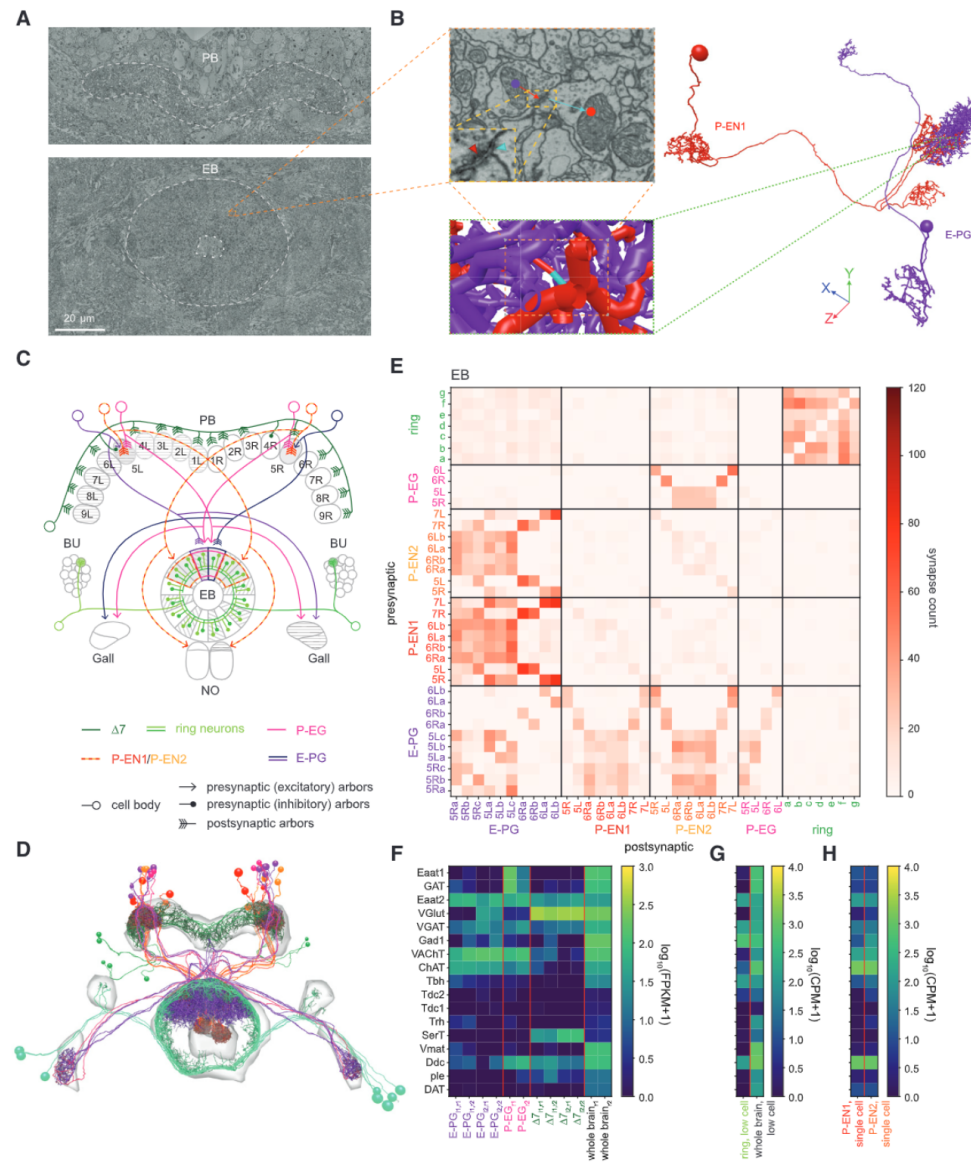


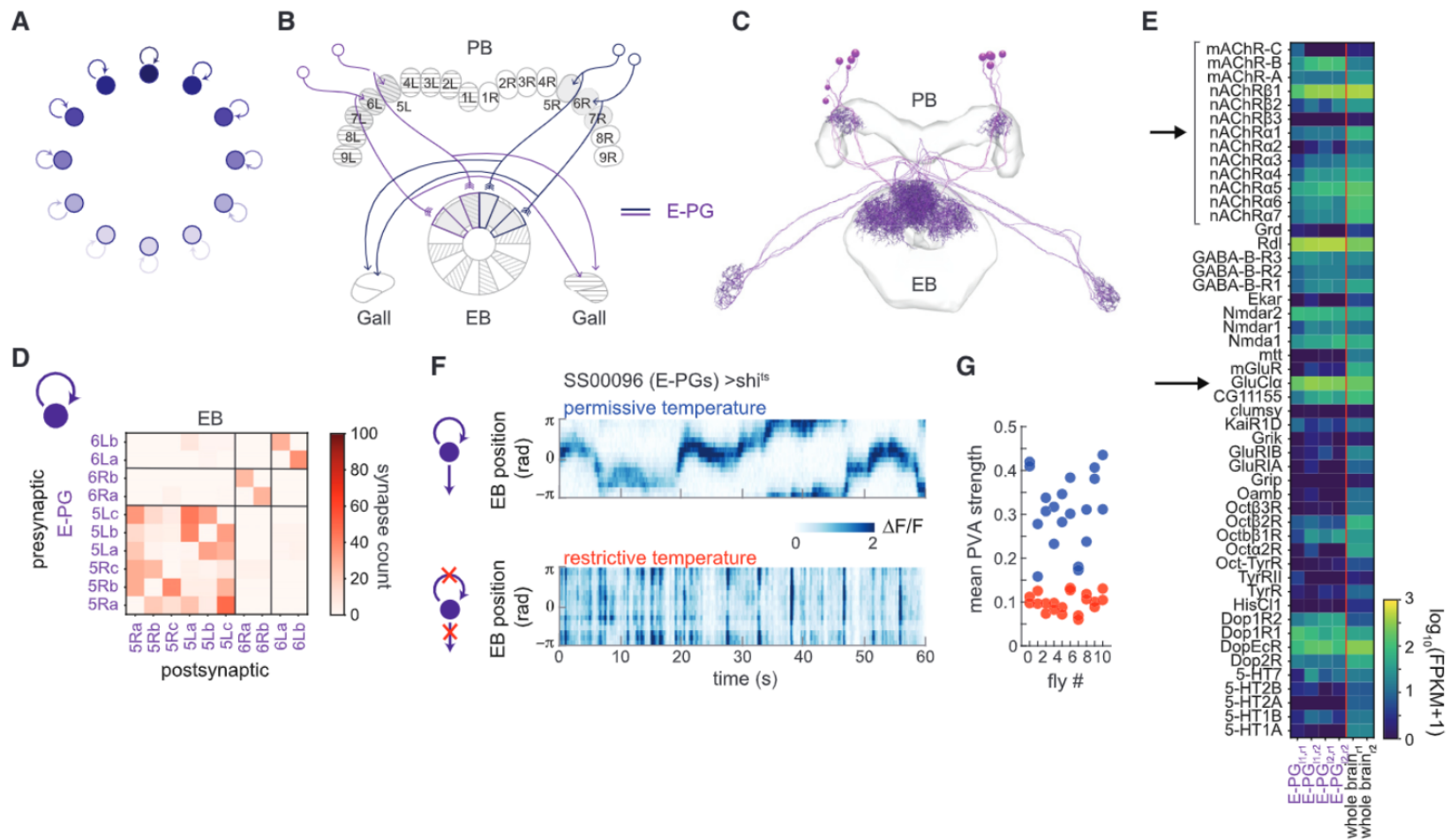
A

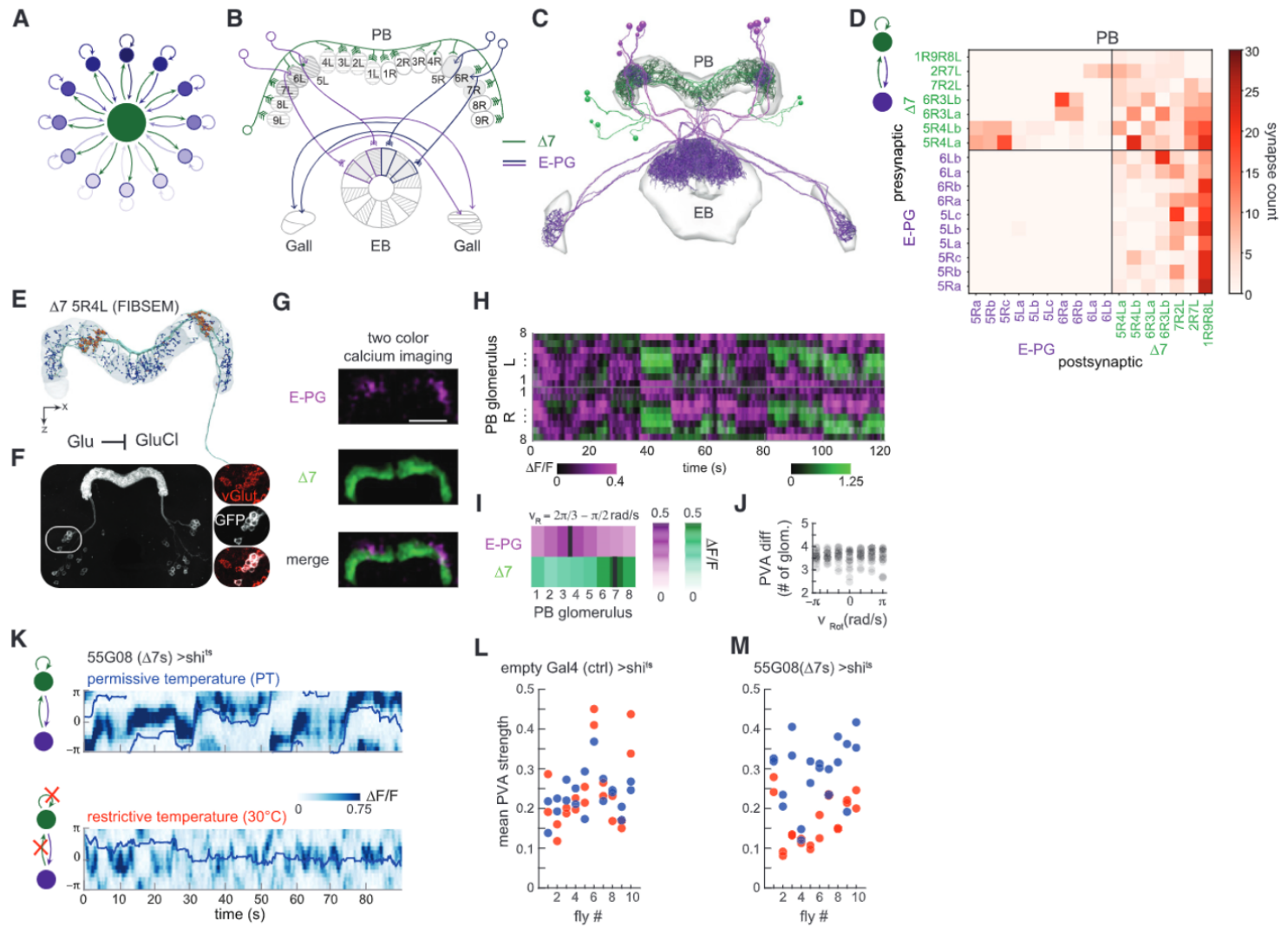


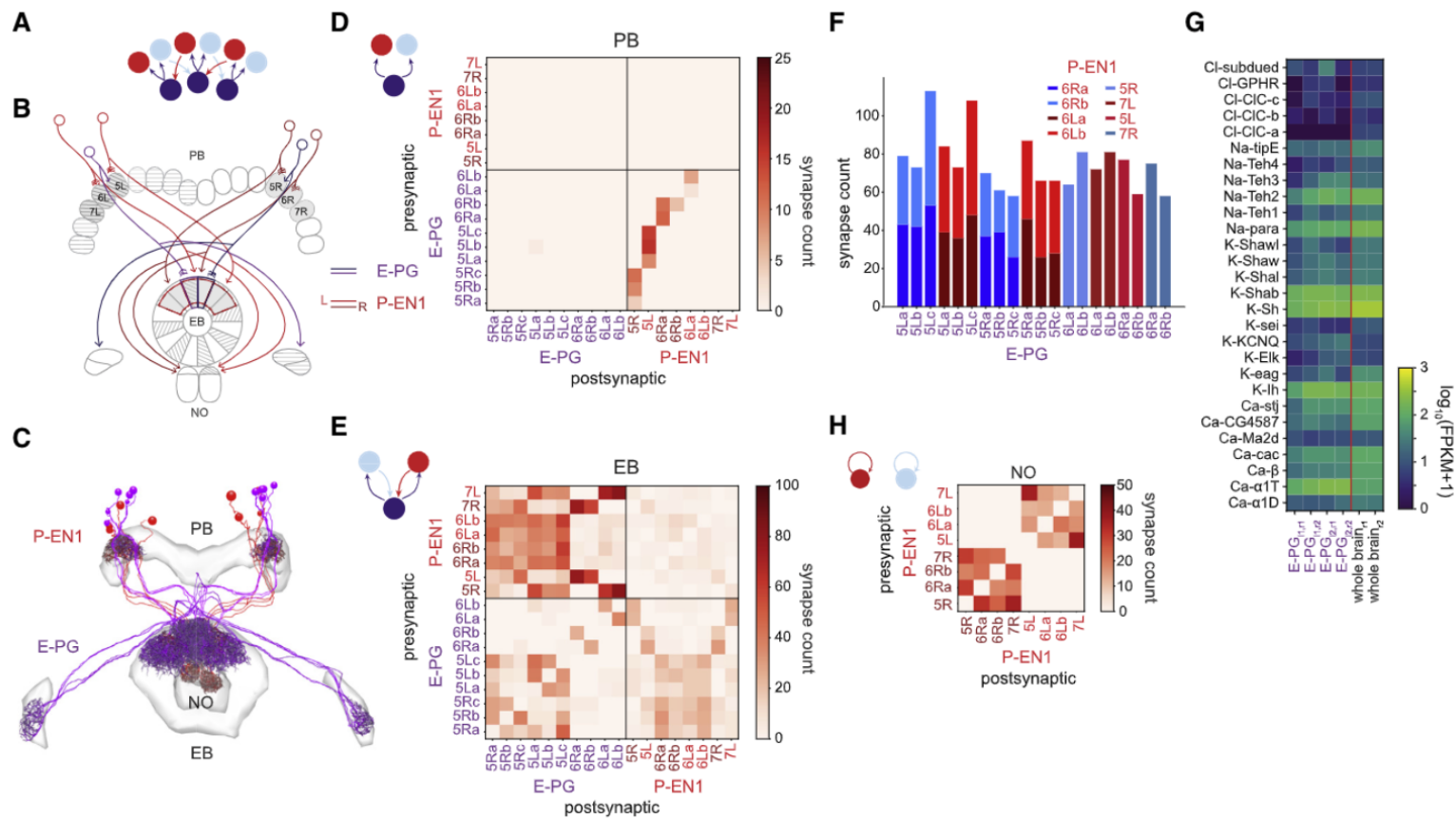
Central complex

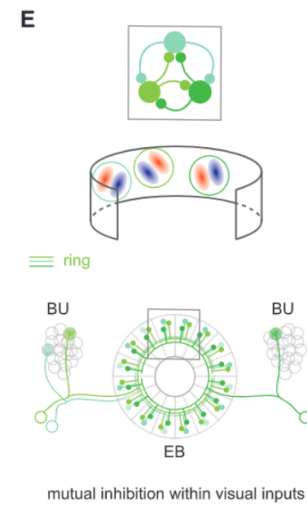
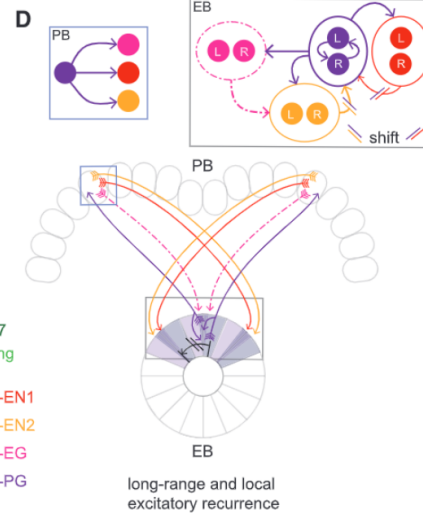
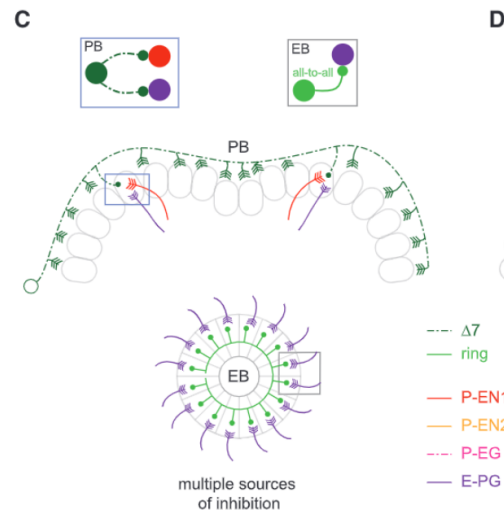
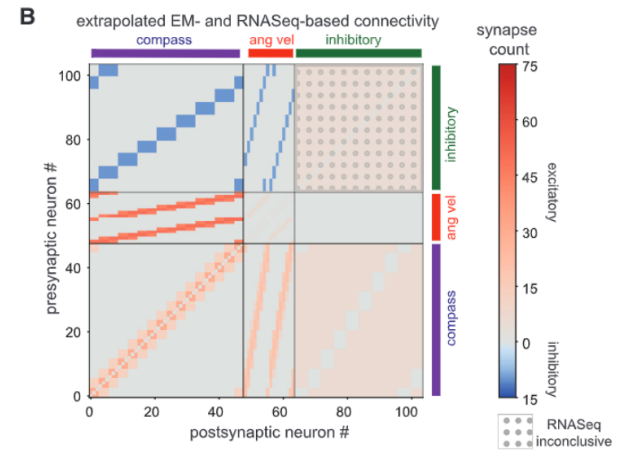
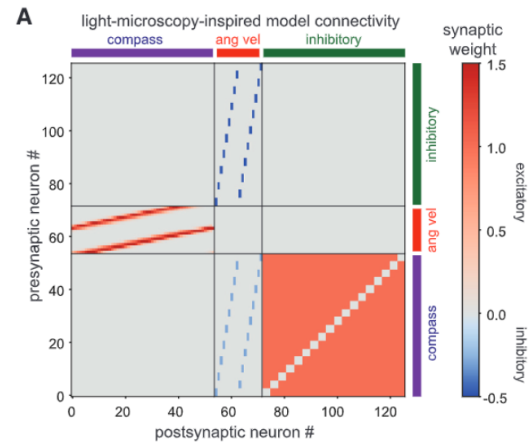
- Ellipsoid body: head directional system
- Protocerebral bridge: integration of self motion / optic flow to velocity
- Nodulus: velocity inputs
- Fan shape body: vector based navigation center



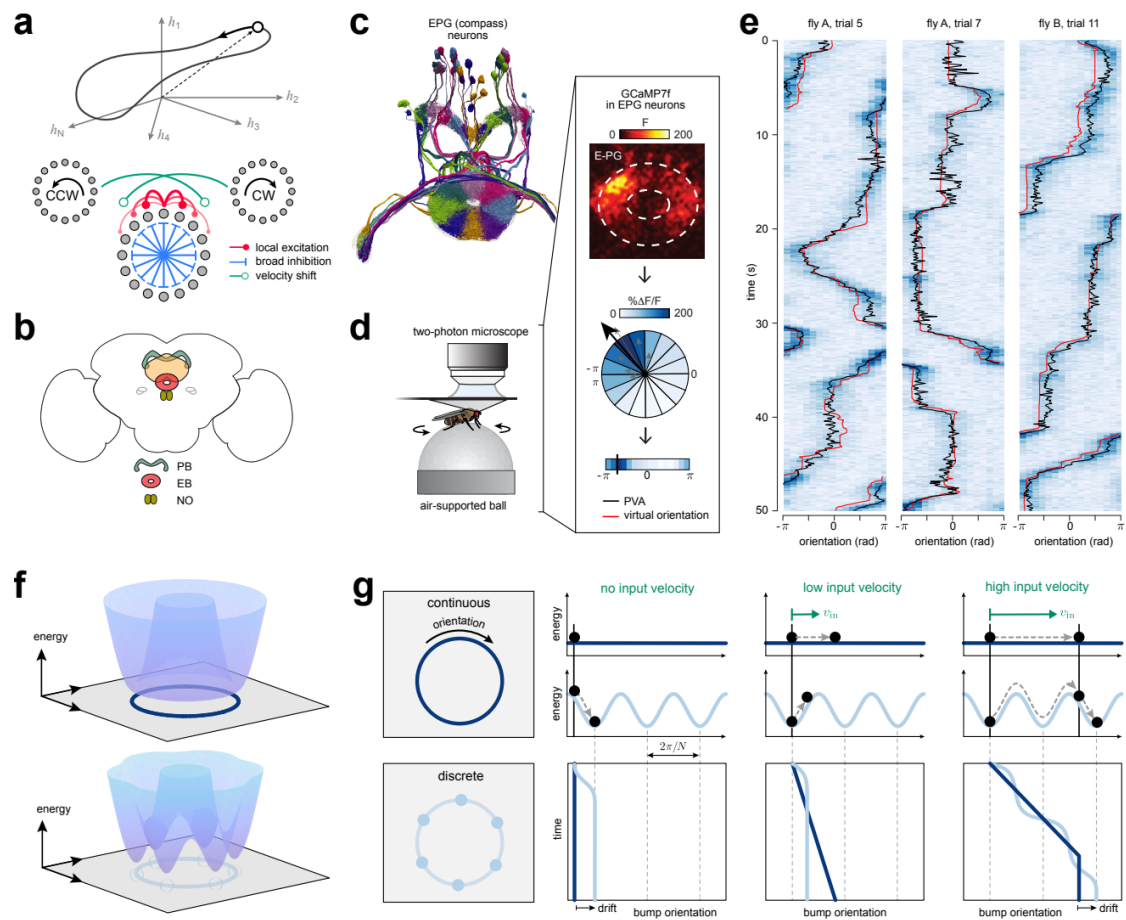


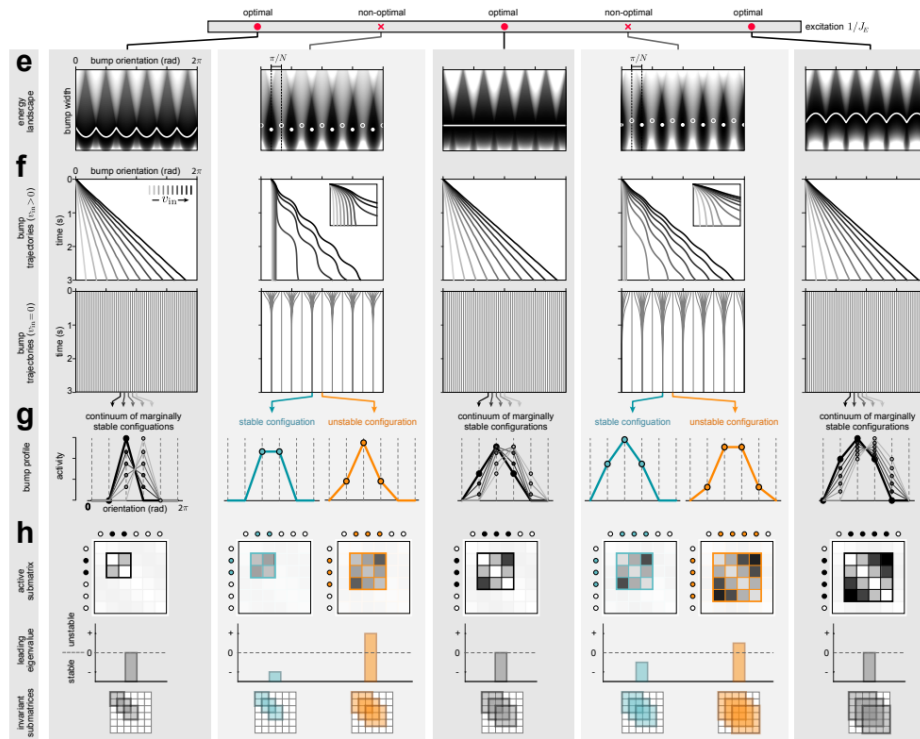
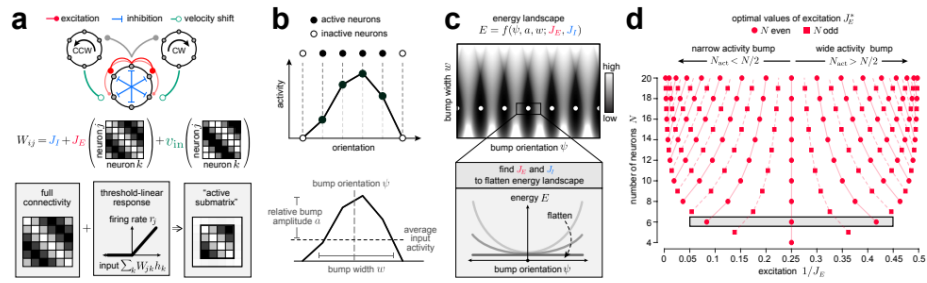




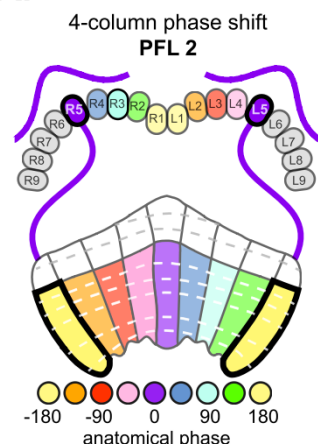


**How can PVA track actual heading
with high accuracy with only
handful of neurons?**

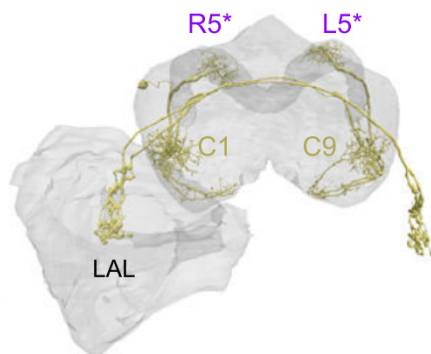




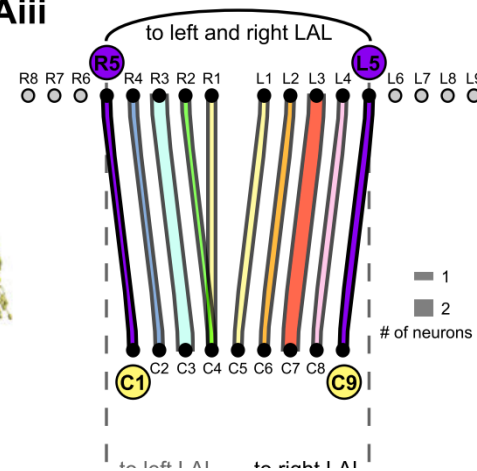
Ai



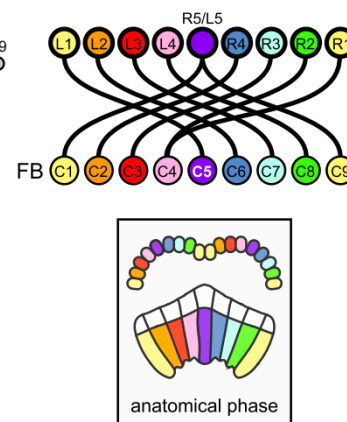
Aii



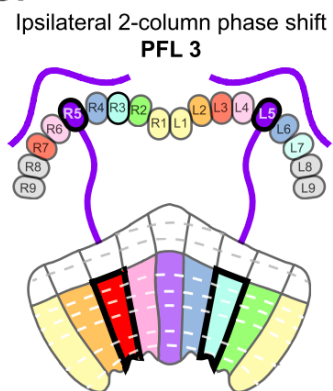
Aiii



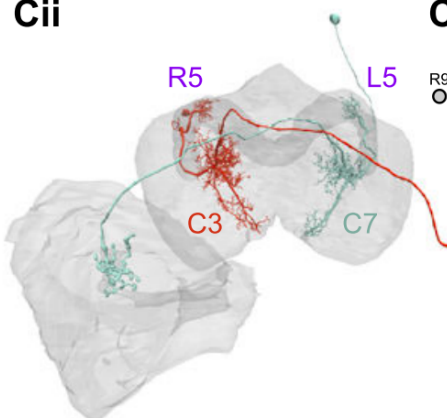
Aiv



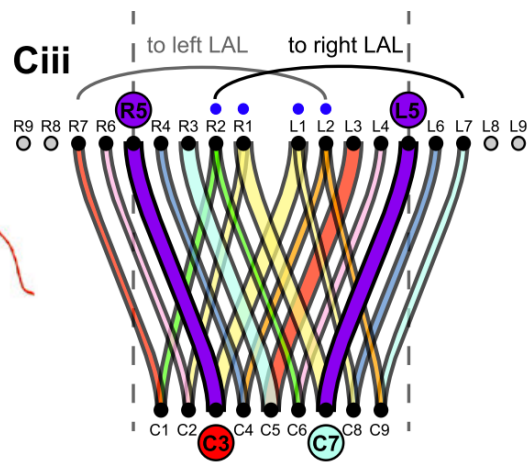
Ci



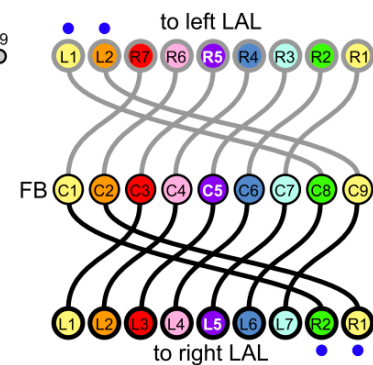
Cii



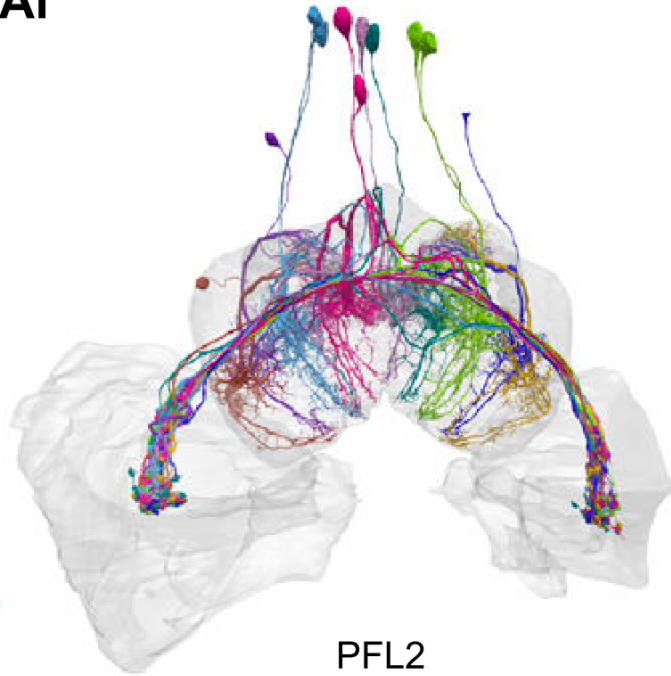
Ciii



Civ

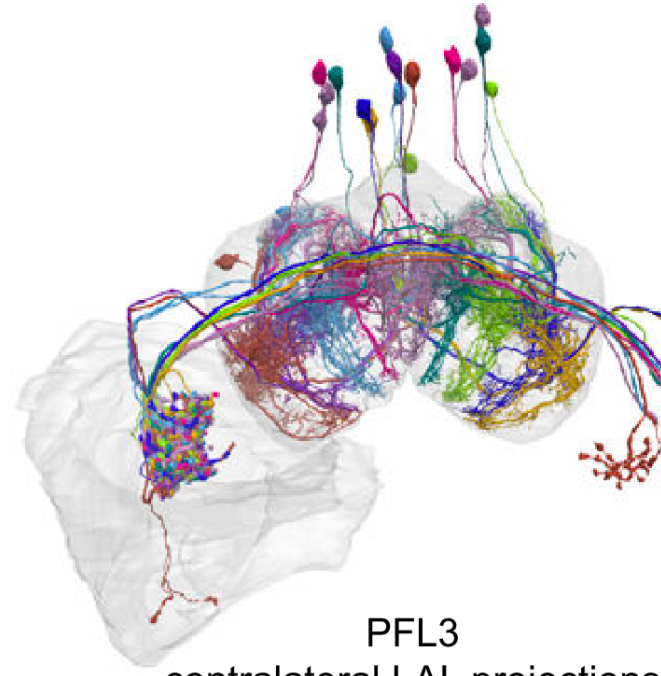


Ai



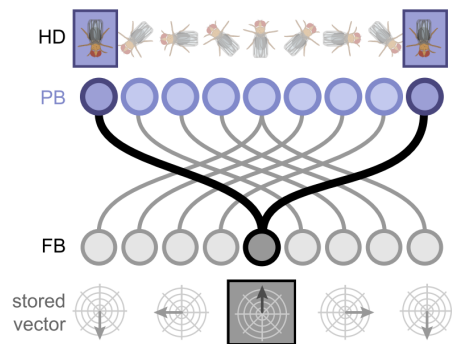
PFL2
bilateral LAL projections
9 columns
12 neurons
4C phase shift

Aiii

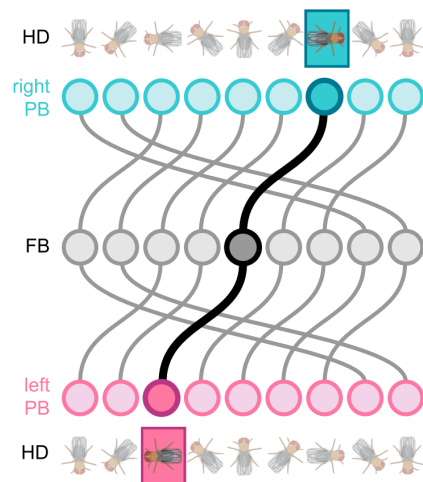


PFL3
contralateral LAL projections
9 columns
24 neurons
2C ipsilateral phase shift

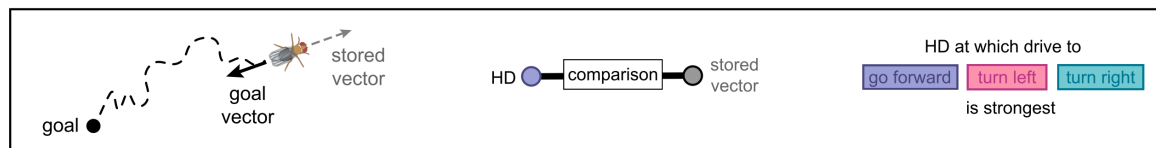
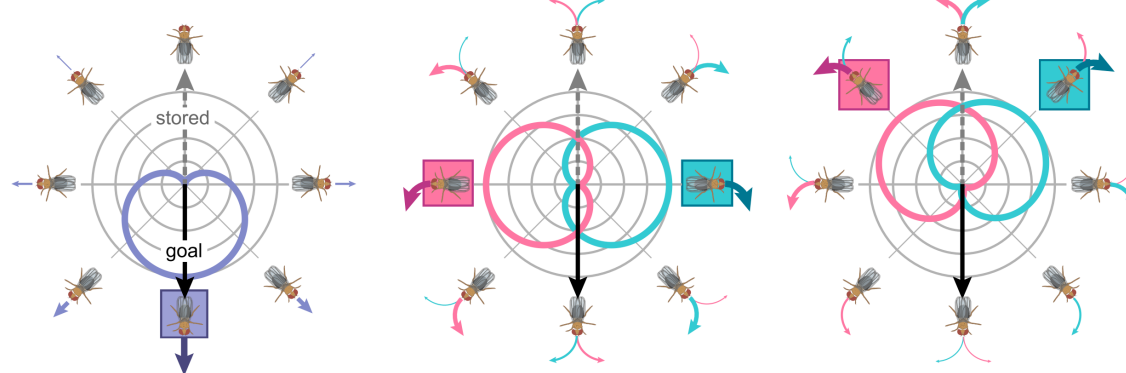
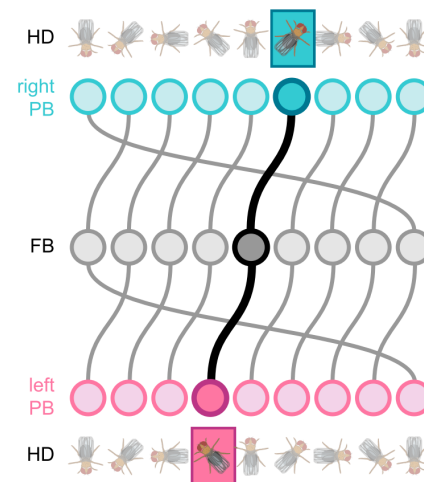
A Body forward (PFL2, 180° offset)

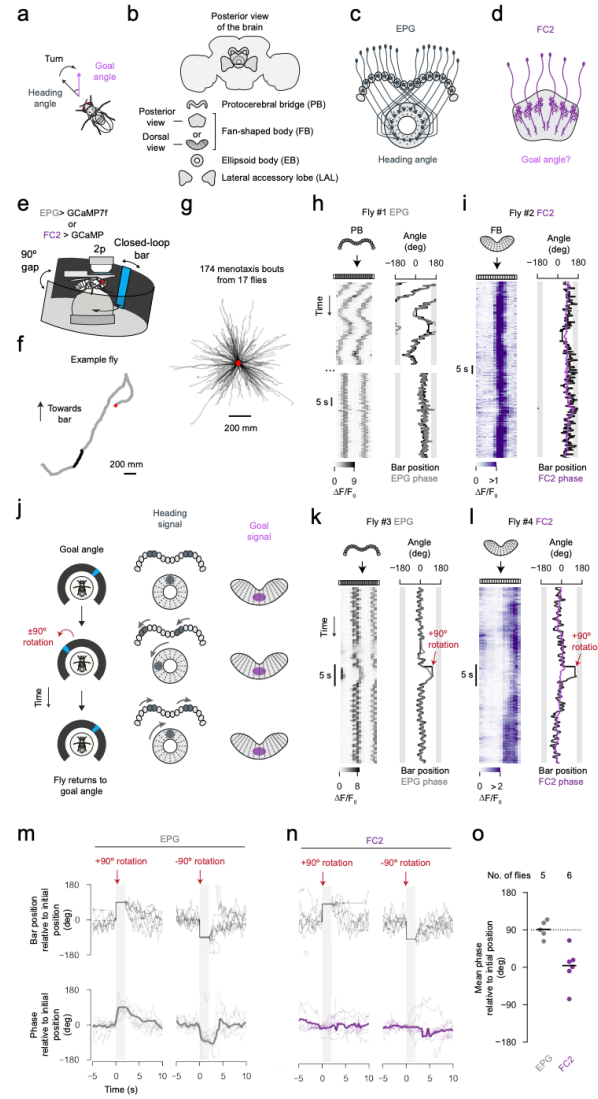


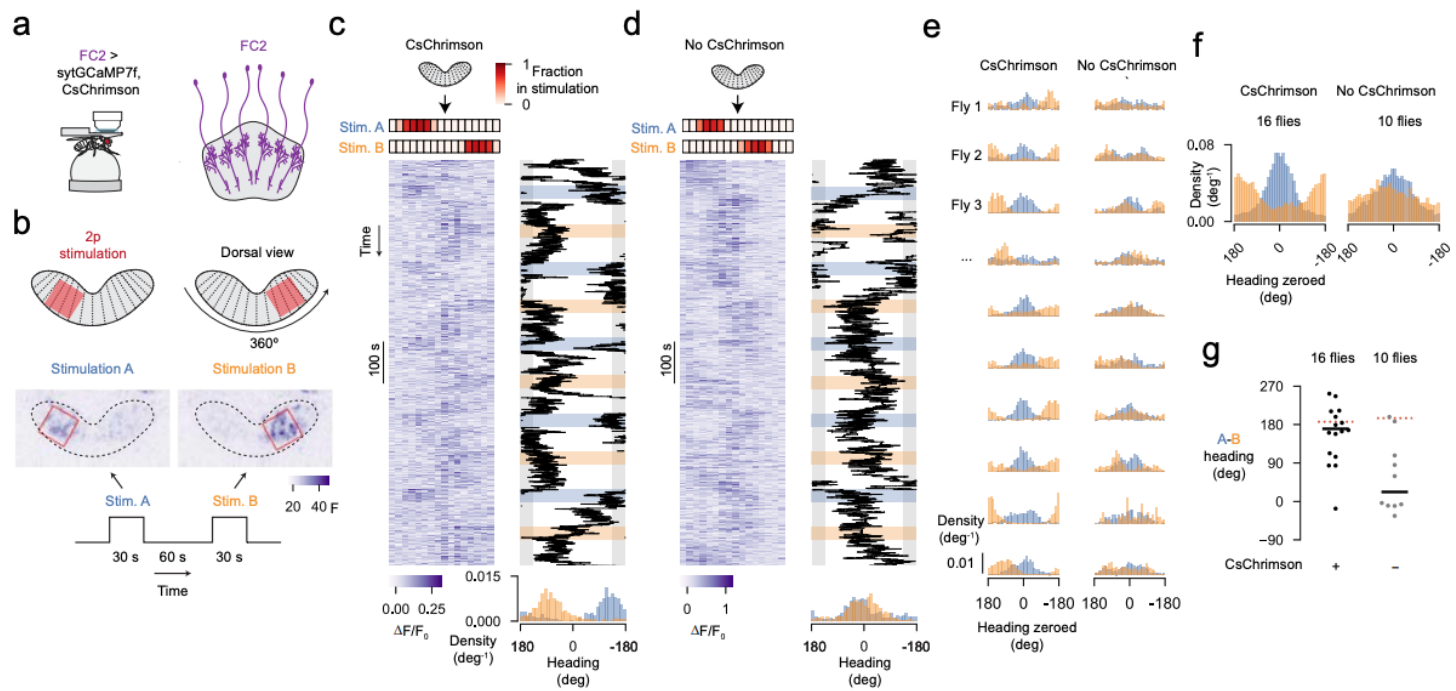
B Body rotation (PFL3, 90° offset)



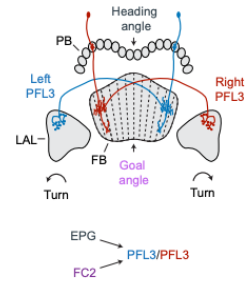
C Head rotation (PFL1, 45° offset)



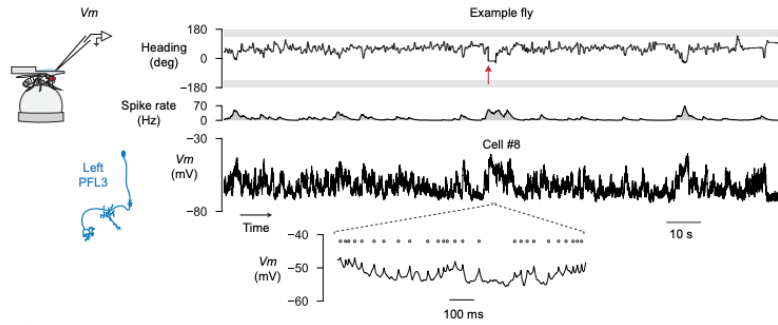




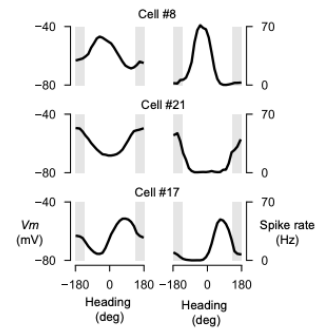
a



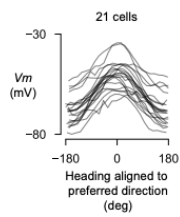
b



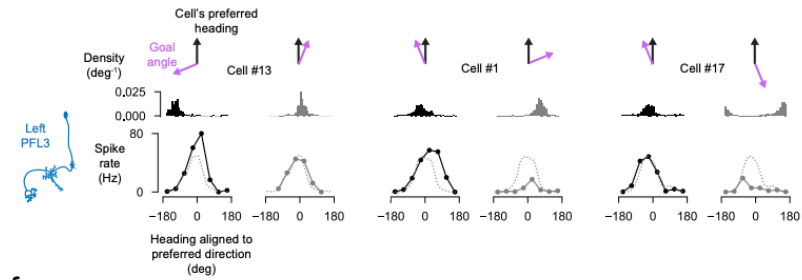
c



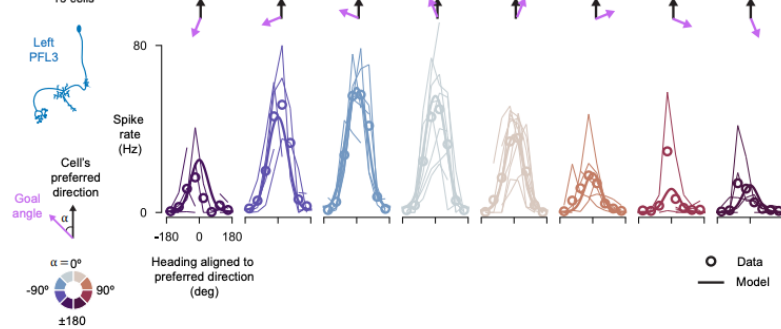
d

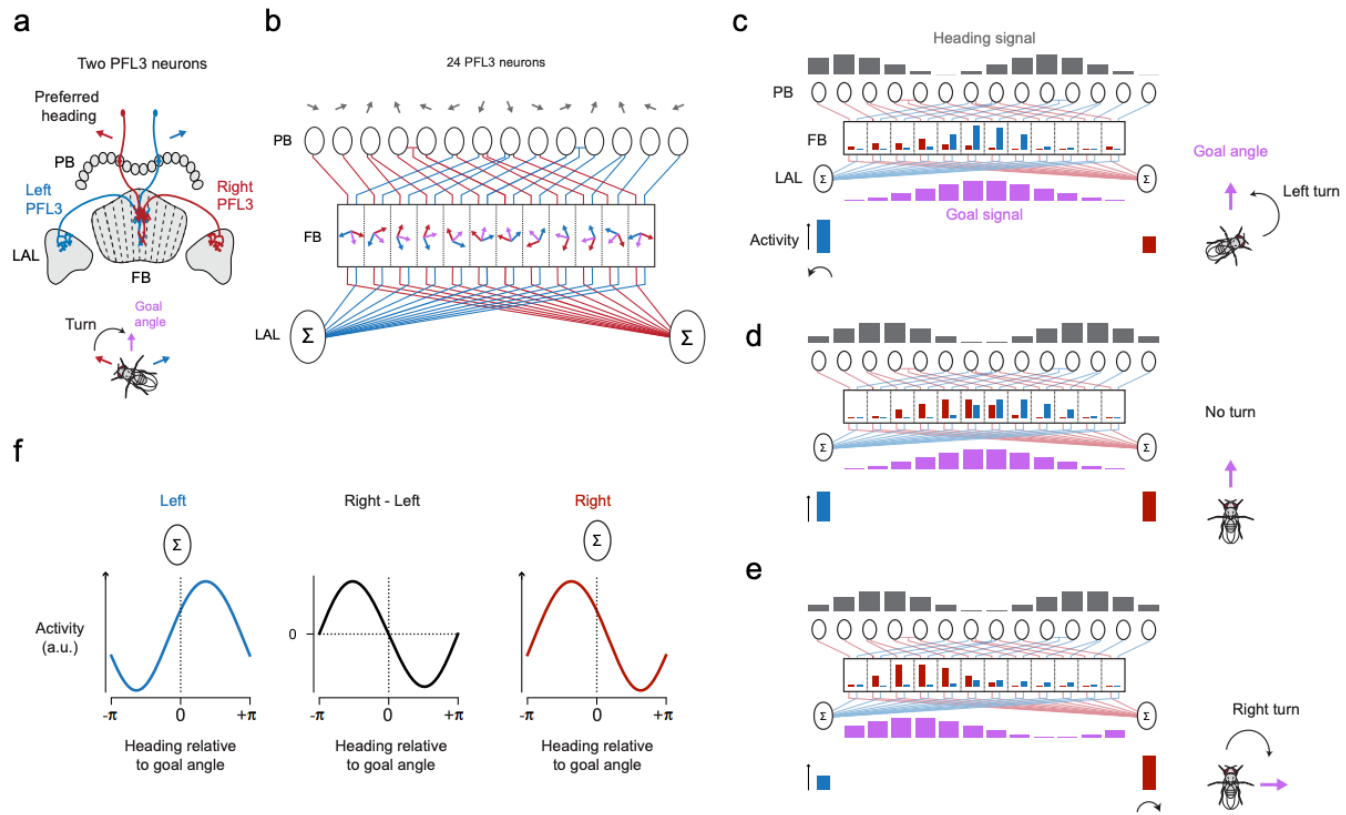


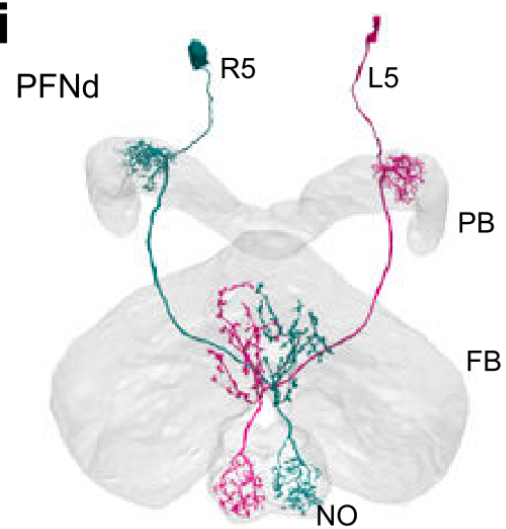
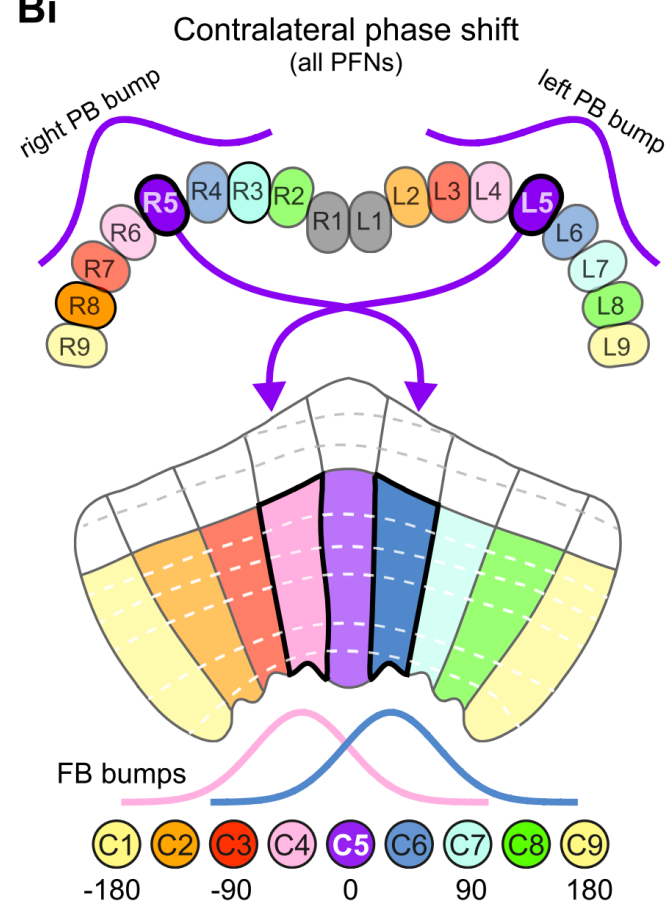
e

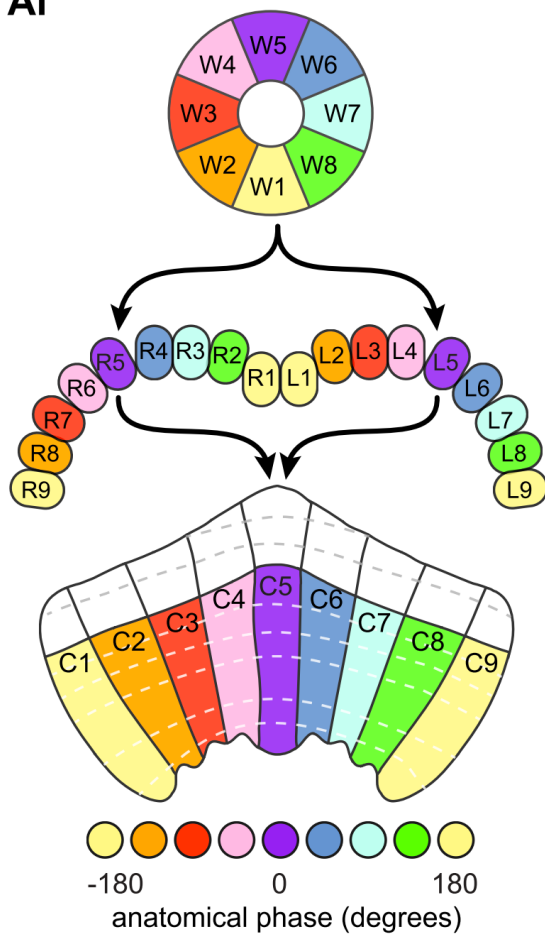
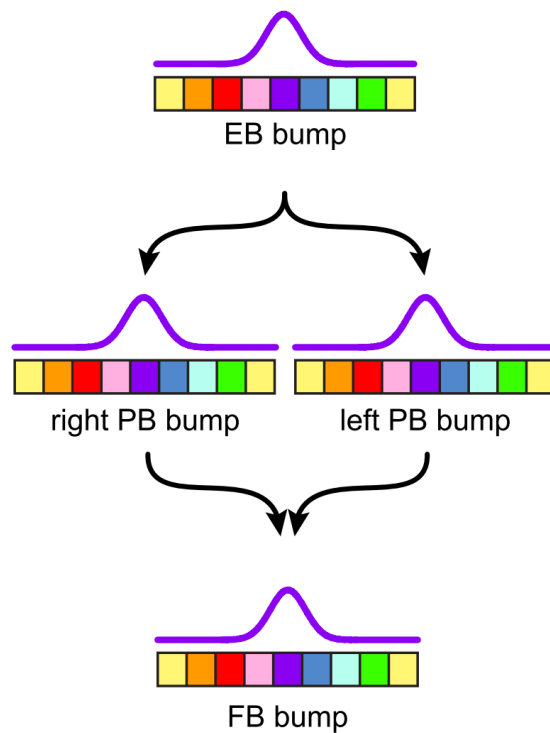
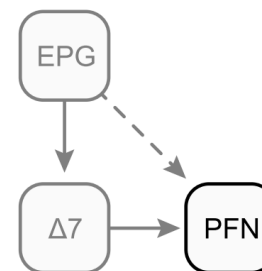
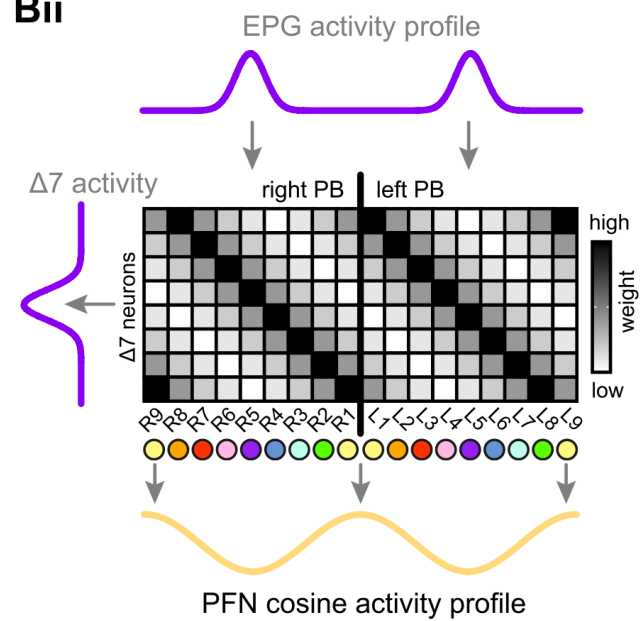


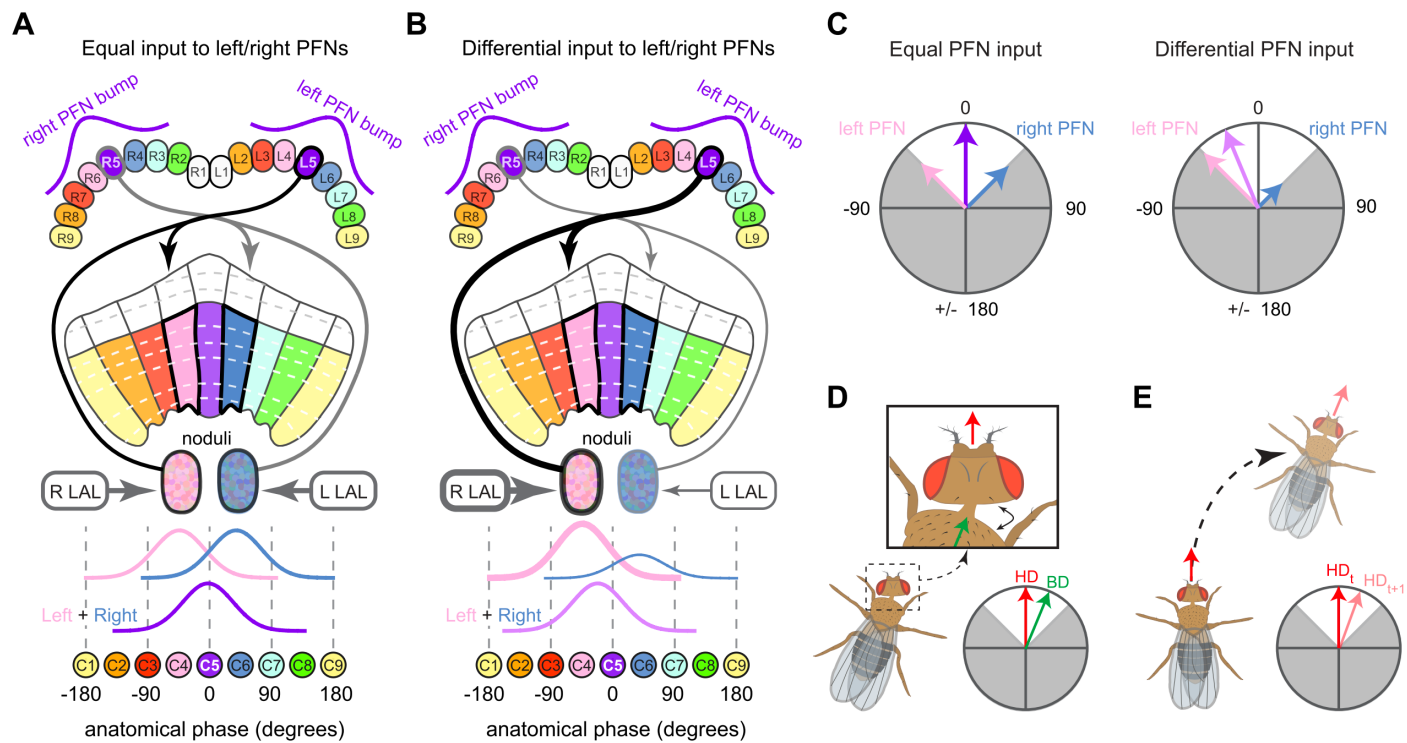
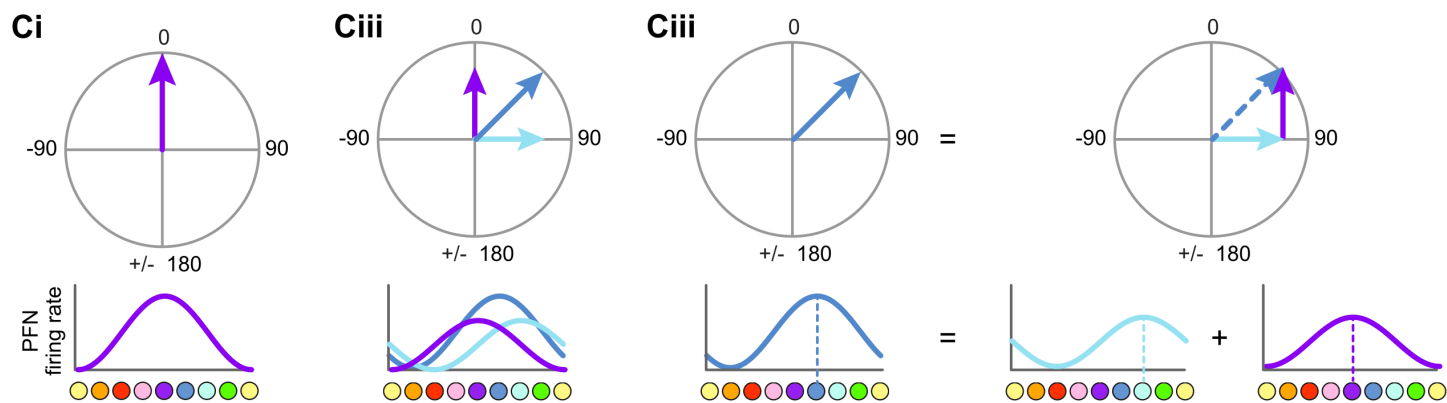
f



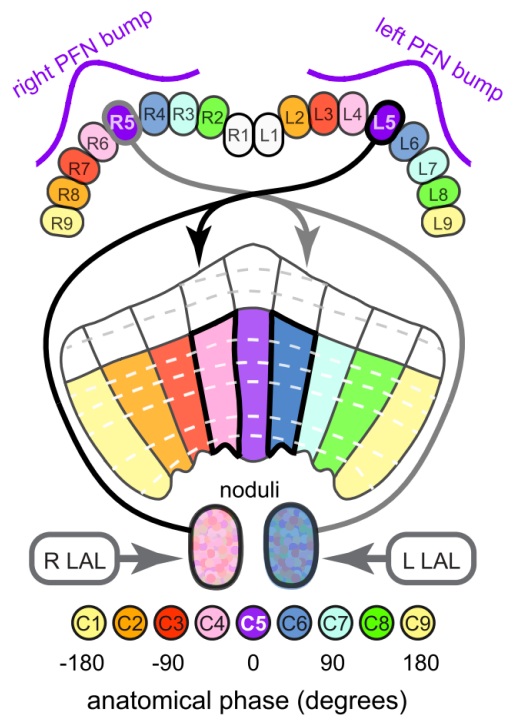


Ai**Bi**

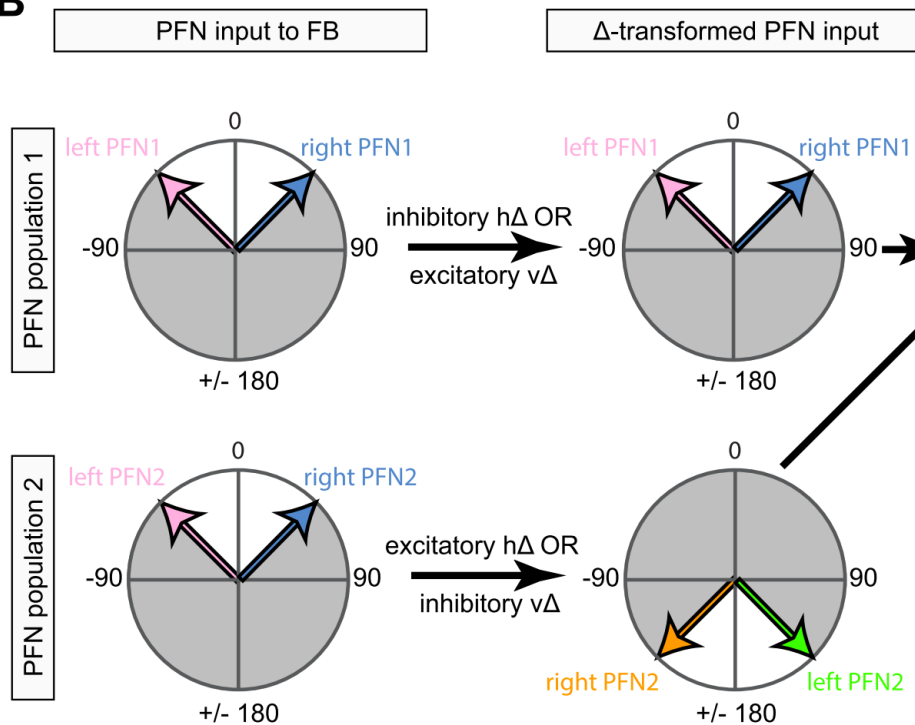
Ai**Aii****Bi****Bii**



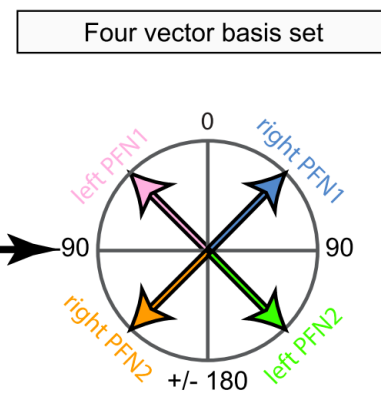
A PFN one-column contralateral offset



B



C



D

