
A visual motion detection circuit suggested by *Drosophila* connectomics

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Opportunity

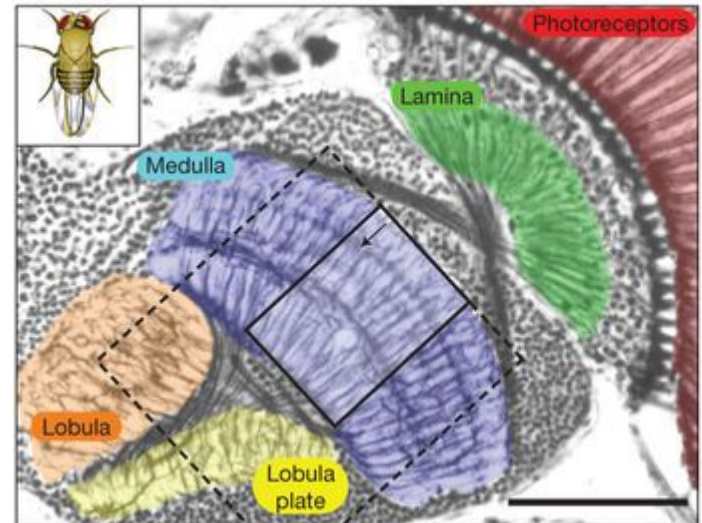
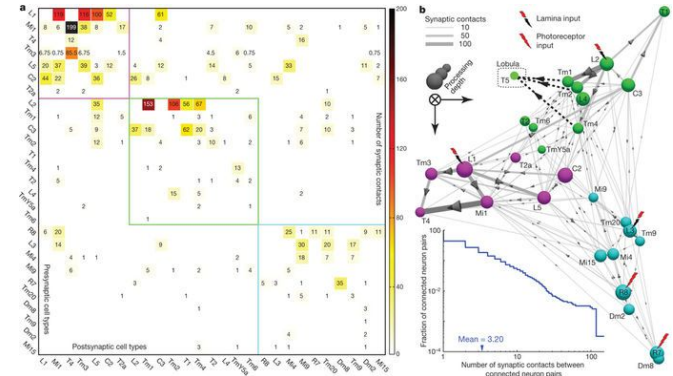
- 50 years of animal behaviour with relation to neuronal circuits to go off of
- We can now do exact computational analysis using EM using known methods
- Local motion detection in *Drosophila* is something we are able to study at scale

Challenge

- Creating a connectome for a whole circuit even in a fly is time-consuming
- Resources
- Others have tried, but found algorithms lacking
- Some *Drosophila* dendrites branch out elaborately
- Sometimes dendrites are thinner than the sample's sectional thickness
- Cannot do a whole fly brain

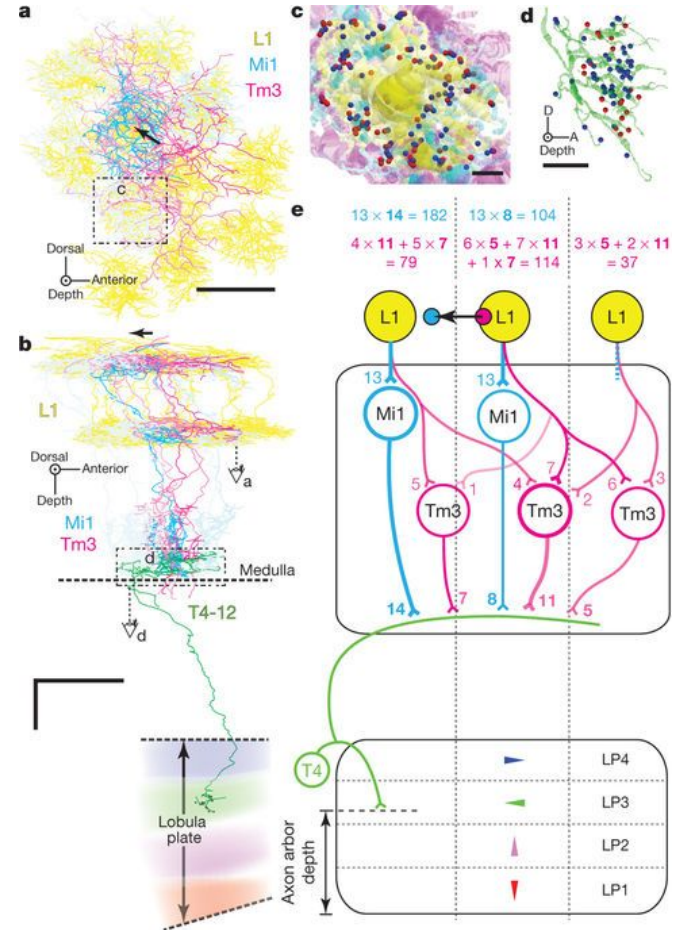
Action

- Targeted sections of brain to find a suspected repeated circuit responsible for vision
- Relied on cell classification based on light microscopy models (56 types)
- Had trouble outlining up to 50% of the synapses
- Had two human proofreaders after machine learning
- Extracted column connectome with 3 classes of cells
- Parsed connectome into three separate pathways
- Needed to find not just motion detection, but also direction detection
- Looked further back into the brain to see if more computation was done for directional detection



Results

- Identified cell types and circuits responsible for color computation
- Identified pathway used for visual contrast
- L1 and L2 type cells responsible for detection which then pass on information to T4 and T5 which do computation for directionality
- T4/ T5 cells come in four types that correspond to cardinal directions
- These cells align spatially in the brain with the direction they detect
- There are preferred layers in the Lobula Plate for each direction
- Measured conduction delay and possible causes
- Confirmed a lot of thought with regards to neuron computation
- Has deep parallels to a lot of vertibraed animals



Future/ Review

- Need to investigate further into tangential detection
 - Has implications for other parts of *Drosophila* brains
 - Can study more invertebrates after this confirmation
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- Well written, clear sentences
 - Graphs with a lot variables are confusing
 - Requires some neuro background for basic terminology
 - Cell type classifications were hard to follow because of their simple labels