Exploring lineages in the larval VNC

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assets/catmaid/Add Neurons from your Lineage to the Selection Table.mp4
Figure 1: Neurons from your Lineage to the Selection Table

assets/catmaid/Rotate View Turn on z Plane.mp4
Figure 2: Rotate View Turn on z Plane

1 Goal

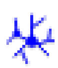
The goal of this lab is to understand how neural lineages help to build functional circuitry. Though the function of some of these neurons isn't completely understood, having a connectivity map can help us generate hypotheses about circuit function and also learn about the developmental origins of these circuits

With a stable internet connection open CATMAID to access the L1 brain. For how-to movies see the first part of this module.

1.1 Pick a lineage:

- NB3-3 (Wreden et al., 2017)
- NB5-2 (Heckscher et al., 2015)
- NB7-1 (Kohwi, Lupton, Lai, Miller, & Doe, 2013)

1.2 Load the neurons that were studied in Mark et al. (2021)

Click on this widget: 

1. Open Neuron Search widget (key binding `/`)
2. Type in the "annotated" text field: **Mark et al. 2019**, push `enter`

1.2.1 Add neurons from your lineage to the selection table

Double check in your selection table that all the neurons from the lineage are loaded** published lineage neurons.

Open 3D Viewer widget (3D , click on all the neurons belonging to your lineage (e.g. A02b_a1l, A02c?_a1l, A02e_a1l, A02g_a1l, A02h_a1l etc.), click "Append" from "Neuron search" in the selection table.

1.2.2 Rotate view and turn on Z plane

Tip: `Shift-click` at a point on the skeleton in 3D view to go to that point in the EM stack

1.2.3 Is your lineage homogenous or heterogenous?

Does it contain motor neurons, interneurons, sensory neurons or a mixture? Please show examples.

1.2.4 Find the entry point of the lineage into the neuropil and show it here:

1.2.5 Select a neuron that is the furthest from the entry point and one that is the closest.

Display them in different colors below

1.2.6 Is the neuron that is closest to the neuropil an early born neuron or a late born neuron?

Explain your rationale.

1.2.7 Do you think the early born neuron is part of the sensory or motor system?

Or a mix? Explain why:

1.2.8 Do you think the late born neuron is part of the sensory or motor system?

Or a mix? Explain why

assets/catmaid/Show a Connectivity Graph.mp4

Figure 3: Show a connectivity graph

assets/catmaid/Export a Movie.mp4

Figure 4: Export a Movie

1.2.9 For the early born neuron, show either a connectivity graph or display all pre- and post-synaptic neurons in different colors:

1.2.10 For the early born neuron, show either a connectivity graph or display all pre- and post-synaptic neurons in different colors:

For your pre- and post- synaptic of the early born neurons Export a movie and save it to your folder

2 Useful widgets:

- shows keyboard shortcuts
- neuron search ('/' also opens this widget)
- 3D viewer of selected skeletons (use this in conjunction with the widget to manage list of skeletons)
- Display network of connectivity

3 Fun search terms:

- Whole motor neurons at A1 segment akira
- DNs from Brain akira
- DNs from SEZ akira
- et al

4 Other papers that have associated published neurons:

- Zwart et al. (2016)
- Masson et al. (2020)
- Burgos et al. (2018)
- Eschbach et al. (2020)
- Carreira-Rosario et al. (2018)
- Miroschnikow et al. (2018)
- Zarin, Mark, Cardona, Litwin-Kumar, & Doe (2019)
- Mark et al. (2021)
- Berck et al. (2016)
- Eichler et al. (2017)
- Andrade et al. (2019)
- Larderet et al. (2017)
- Ohyama et al. (2015)
- Jovanic et al. (2016)
- Schlegel et al. (2016)
- Jovanic et al. (2019)
- Fushiki et al. (2016)
- Takagi et al. (2017)
- Tastekin et al. (2018)
- Imambocus et al. (2022)
- Kohsaka et al. (2019)
- Heckscher et al. (2015)
- Gerhard, Andrade, Fetter, Cardona, & Schneider-Mizell (2017)

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