Color-blindness of direction-selective units in the zebrafish optic tectum

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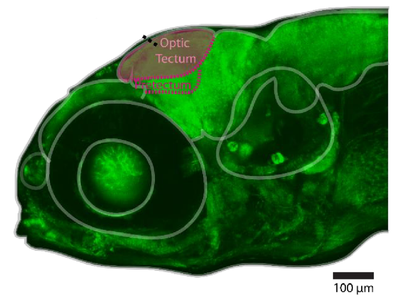
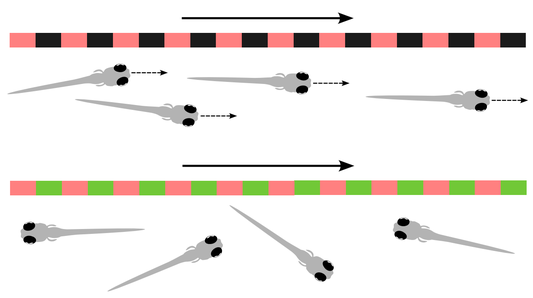


Introduction

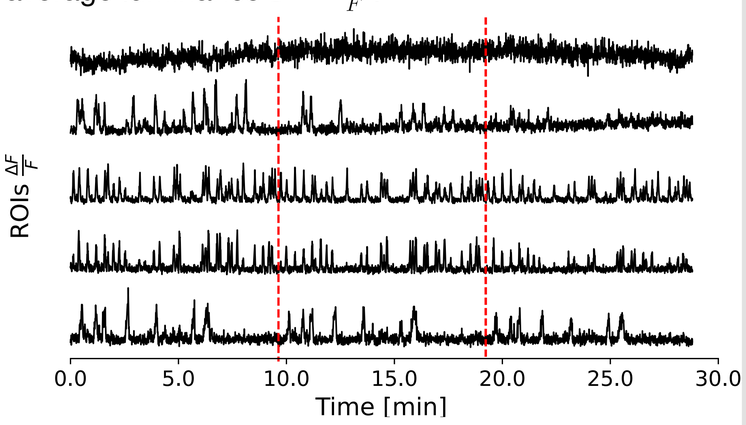
Color has a big influence on motion vision in zebrafish. Orger and Baier (2004) displayed with the optomotor response of zebrafish that motion blindness can be indueced to a grating of different colors.



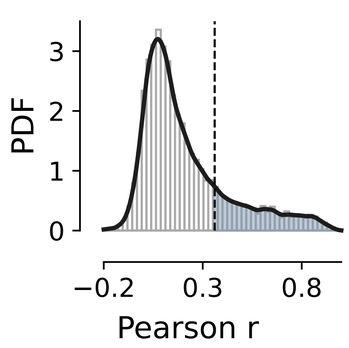
But little is known about the cortical structures conveing the „color-motion“ perception. We wanted to the investigate the optic tectum of the zebrafish larvae with calcium imaging.

Preprocessing:

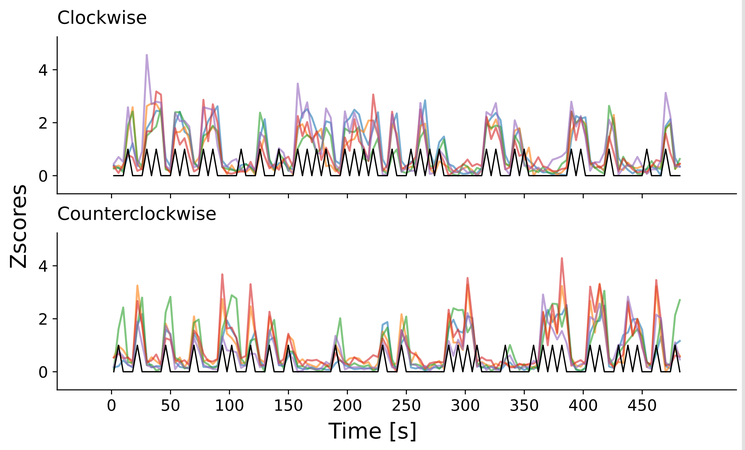
1. Region of Interests (ROI): corrosponds to neurons with genetically indueced calcium indicators. The lumiance F of the calcium imaging is calculated from the change of luminance normalized to the average luminance $F = \frac{\Delta F}{F}$.



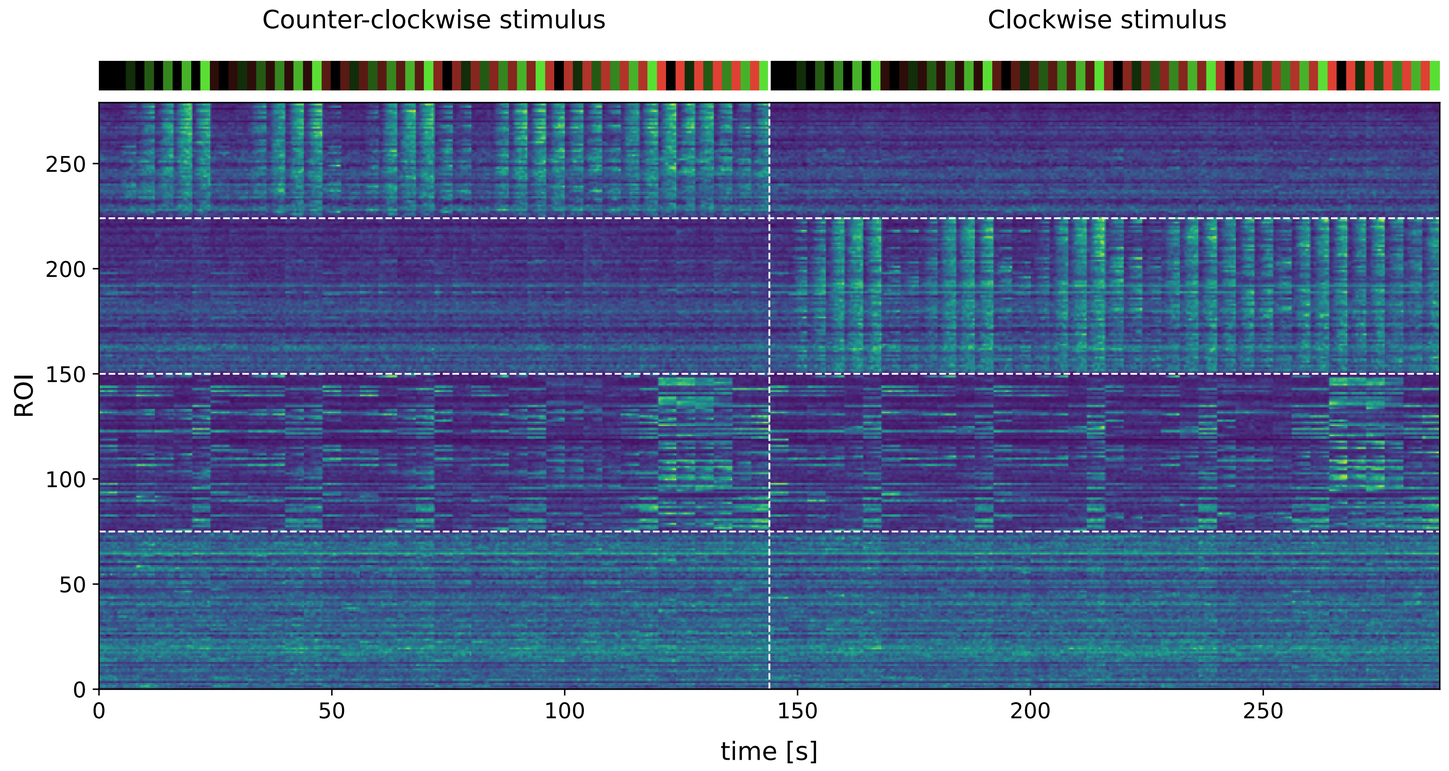
2. Active ROIs: To get the active ROIs we computed the correlation within 3 repeats of the same stimulus.

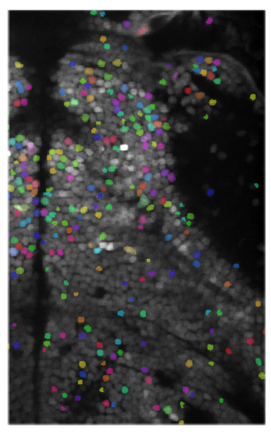


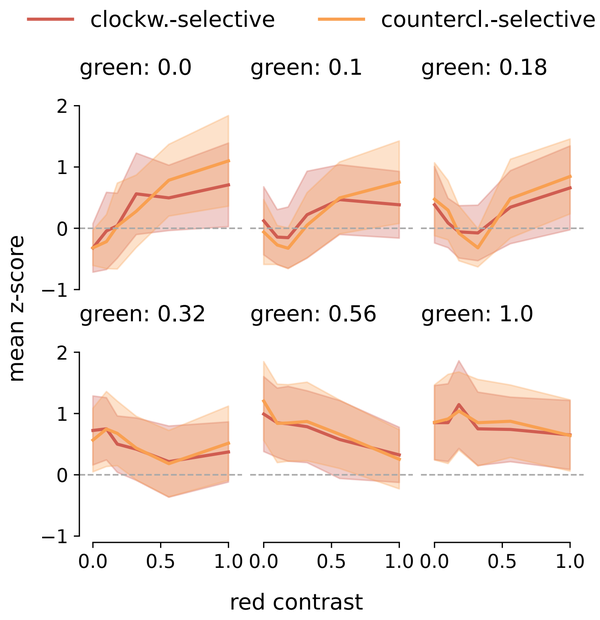
2. Direction selective ROIs: next Step was to search for ROIs that correlated with a direction selective regressor (1 for clockwise = CW or counterclockwise = CCW, else is 0).

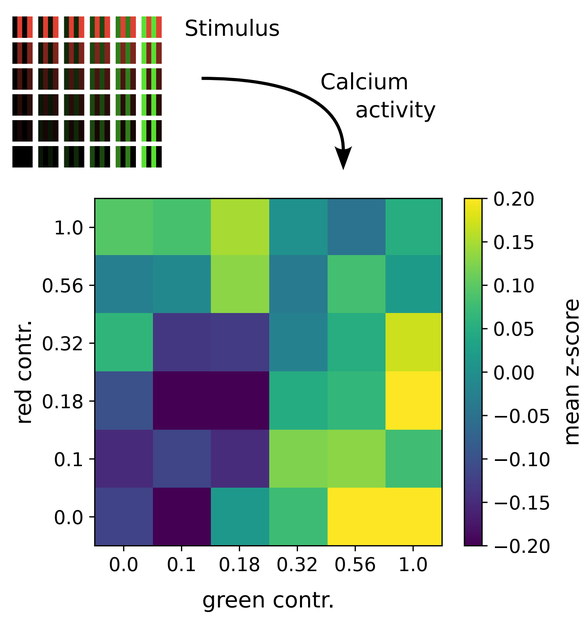


2-photon calcium imaging



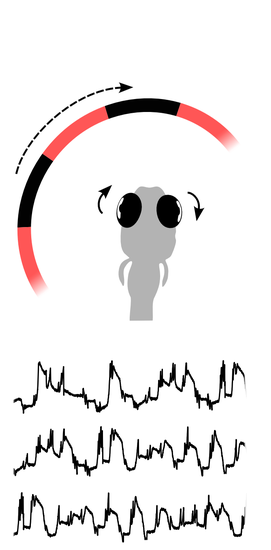

ROIs on right optic tectum

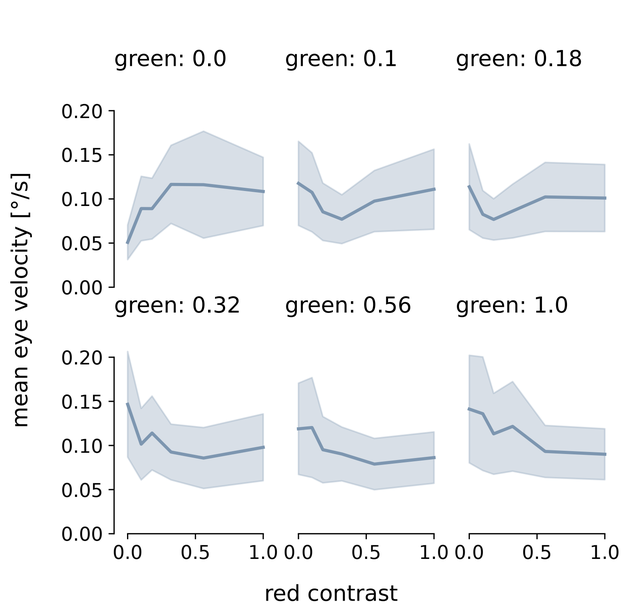


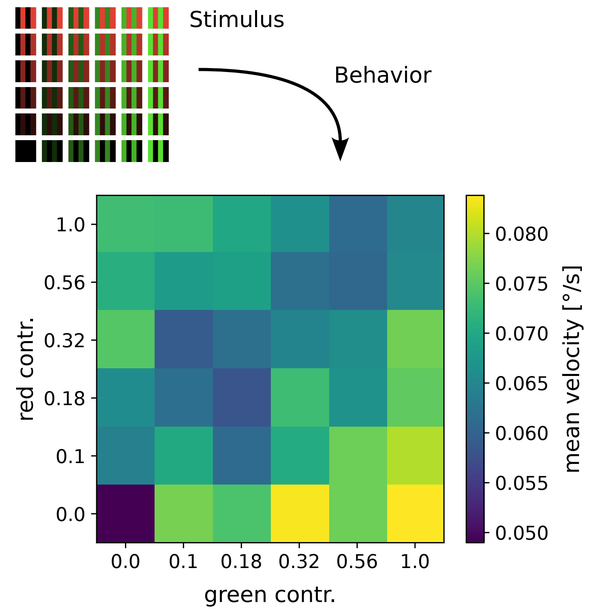


- Calcium is activity was lowest, when the acromatic contrast was zero.
- Both directions CW and CCW were responing equally

Behavior







- The Optokietic response show similiar results as the calcium imaging.

Conclusion

We observed that the optic tectum of the zebrafish encodes for color directed motion stimulie.The optic tectum is mottion blind for various contrast levels