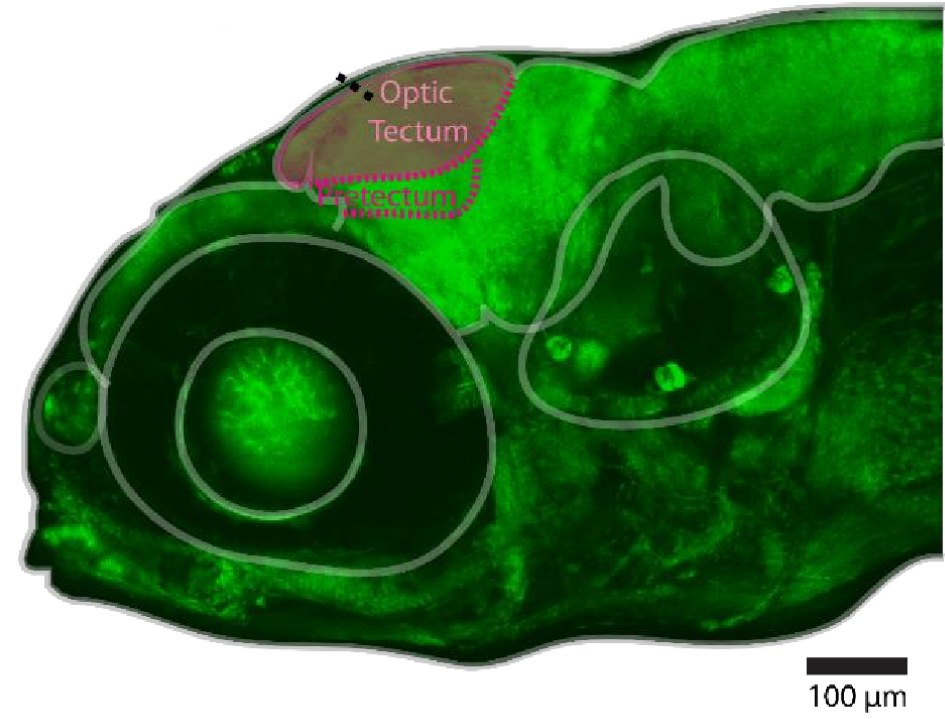


# Color-blindness of direction-selective units in the zebrafish optic tectum

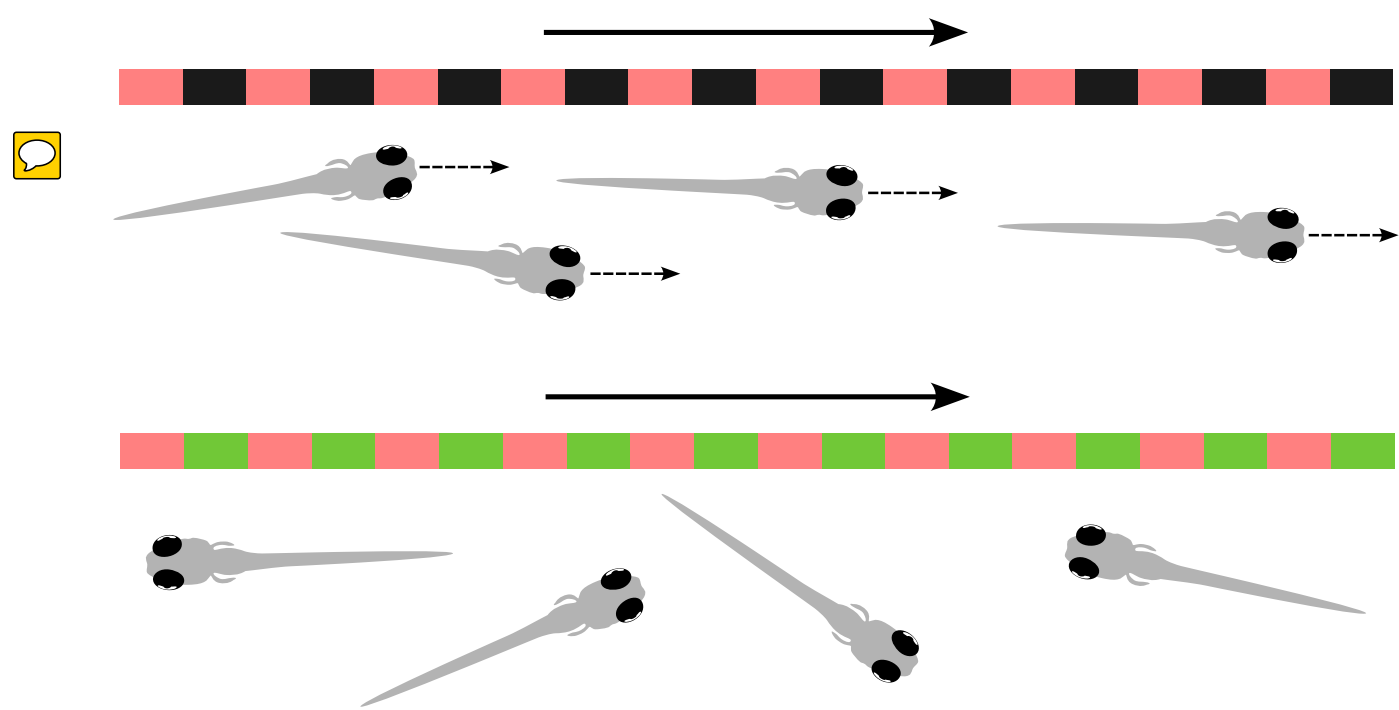
Alexander Wendt, Patrick Weygoldt

Supervisor: Aristides Arrenberg, Tim Hladnik, David Burkardt



## Introduction

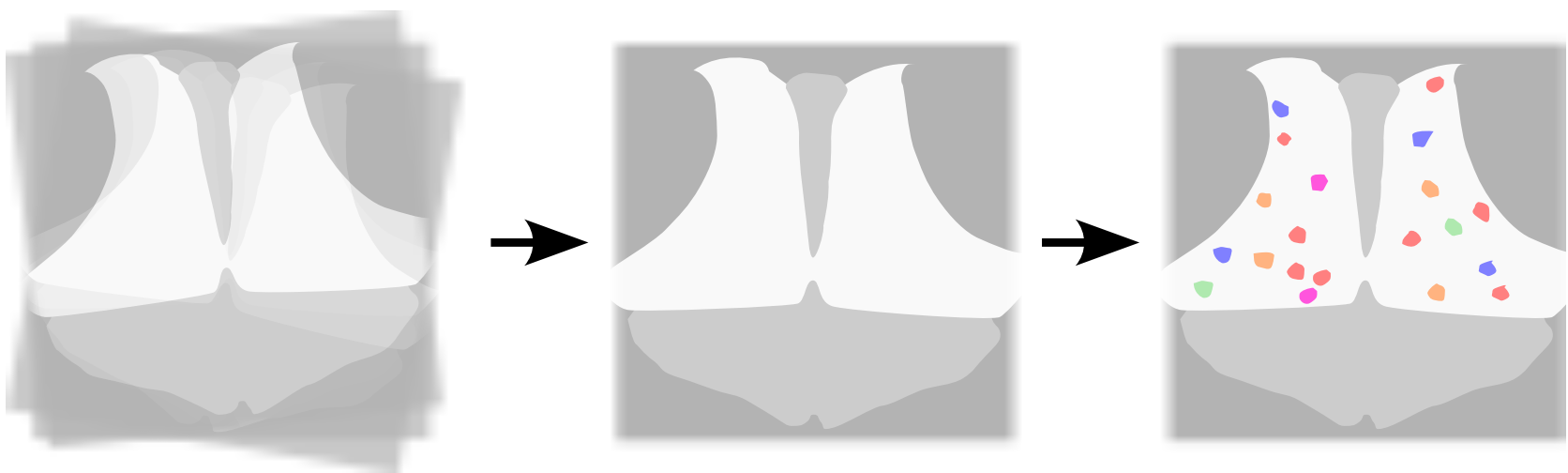
Orger and Baier (2004) demonstrated that chromaticity has a big influence on a zebrafish's ability to perceive motion. The optomotor response to gratings showed that combinations of different green and red **contrasts** can be used to null motion perception.



Little is known about the sensitivity of **direction selective** units in the midbrain to chromatic contrast. We investigated the activity of direction-selective units in the optic tectum of zebrafish in response to gratings of various color contrasts using a combination of two-photon microscopy and calcium imaging.

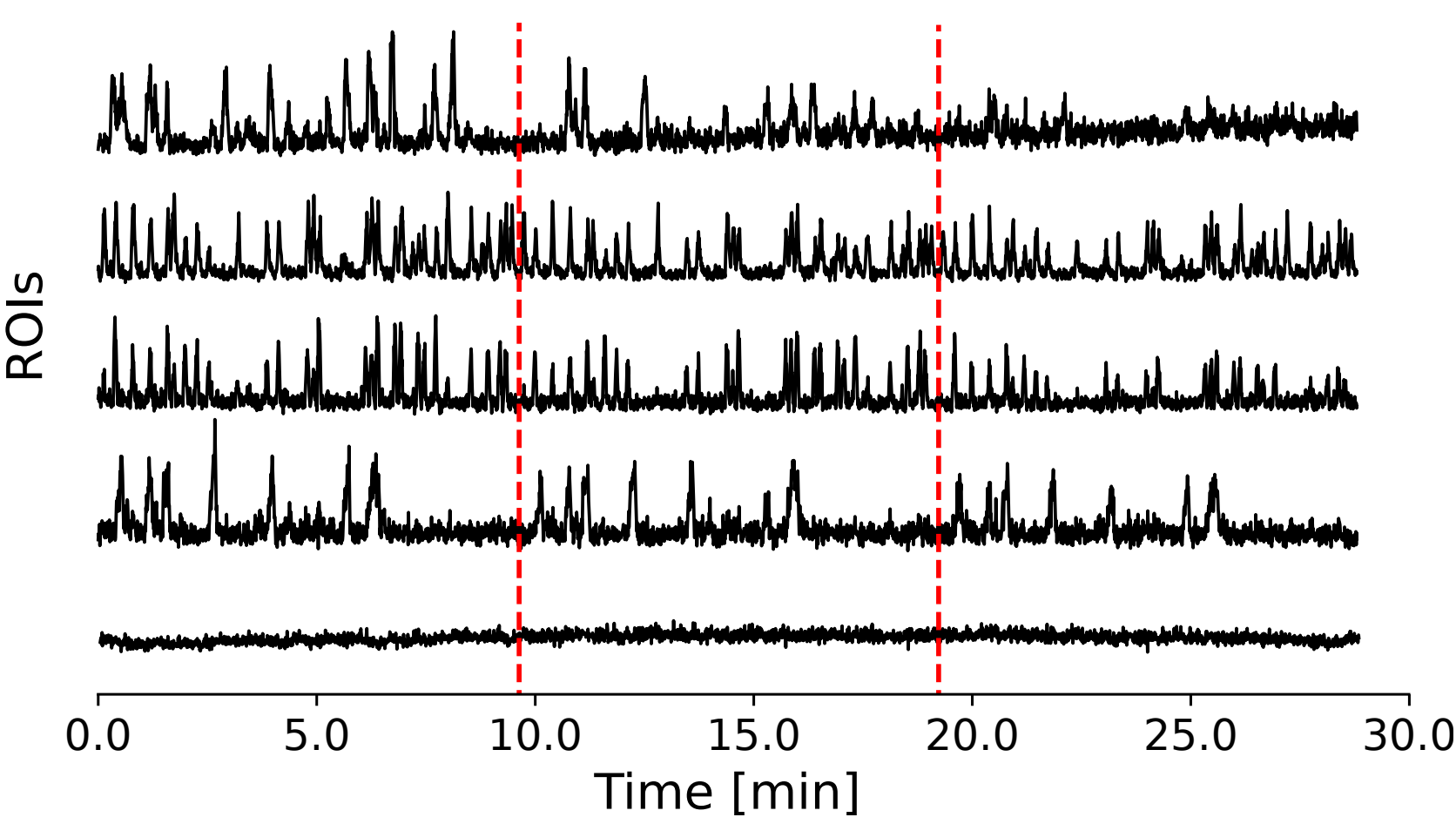
## Preprocessing:

### 1. Registration and Segmentation



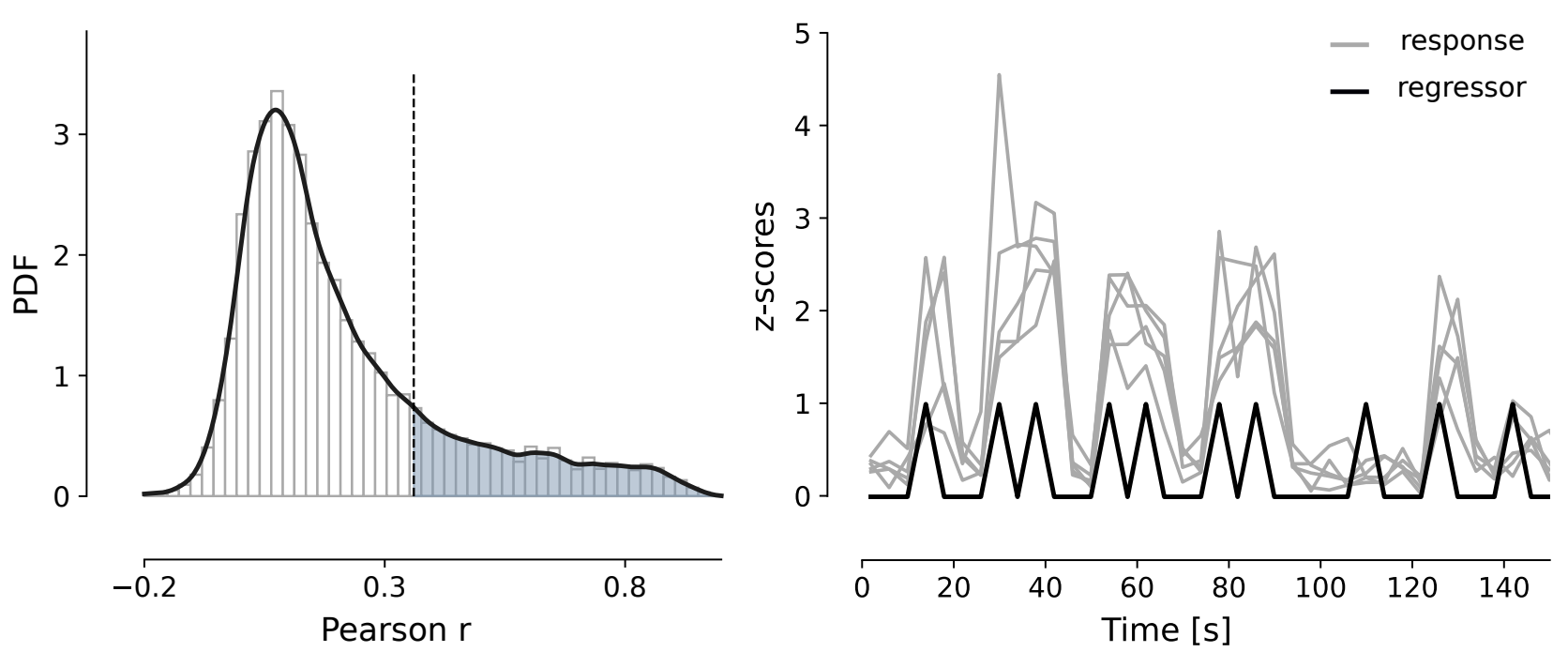
- Alignment of images across time.
- Detection and segmentations to regions of interests (ROIs).

**2. Region of Interests (ROI):** corresponds to cells with genetically encoded calcium indicators. Fluorescence increases with the release of calcium in a cell if excited by a IR-laser.

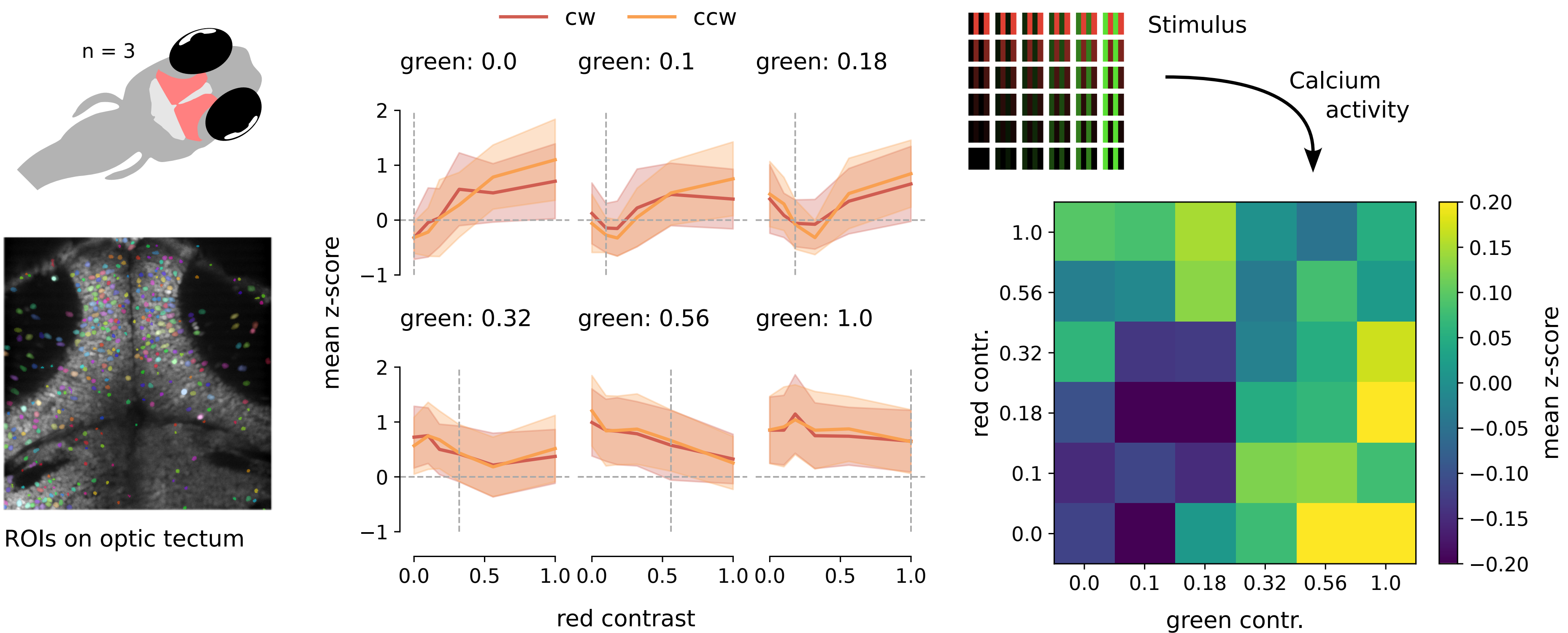
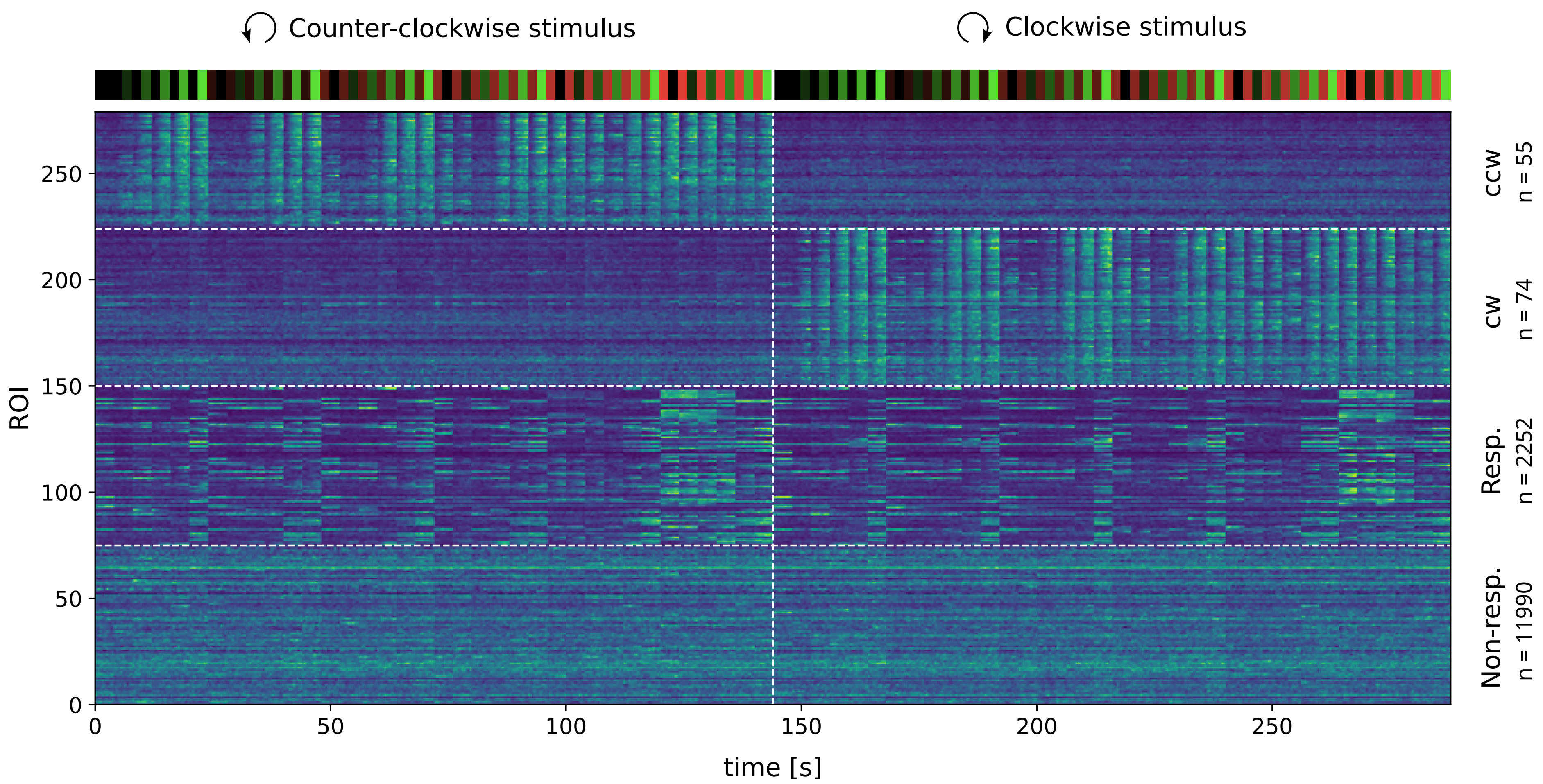


### 3. Active and direction-selective ROIs:

- Strongly autocorrelated ROIs across stimulus repeats are „responding“.
- ROIs that correlated with a direction regressor (clockwise cw or counterclockwise ccw) are direction selective.

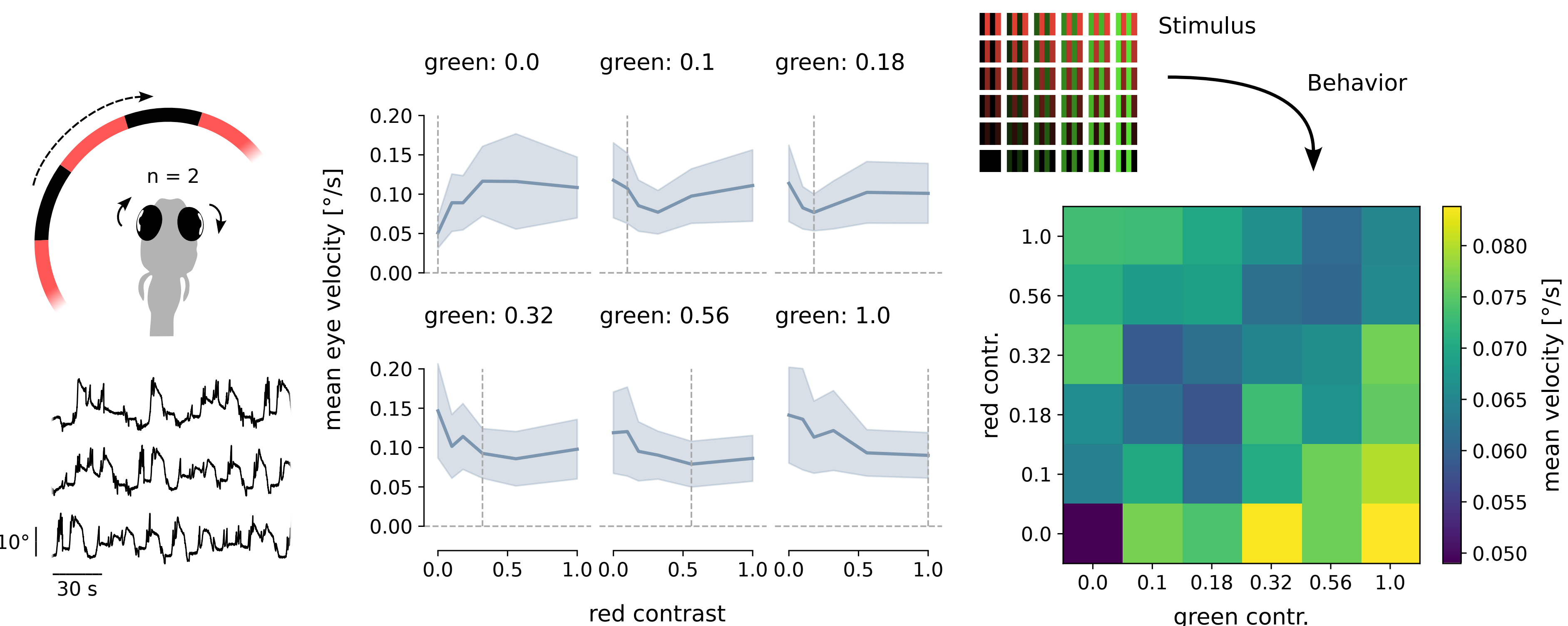


## 2-photon calcium imaging



- ROIs responded to moving gratings of red and green and both populations (cw, ccw) responded similarly.
- If both red and green had the same contrast the response was suppressed indicating color blindness of direction selective units.
- A slight shift in the troughs of activity could be due to by a higher intensity of the green stimulus compared to red.

## Behavior



- The behavioral response (OKR) reflects the pattern shown in calcium activity.

## Conclusion

- We observed that the **optic tectum lack the response** to red-green merged out-of-phase stimuli and **is therefore** color-blind