Data from: ***Neural circuits in the mouse retina support color vision in the upper visual field***

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Abstract

Color vision is essential for an animal's survival. It starts in the retina, where signals from different photoreceptor types are locally compared by neural circuits. Mice, like most mammals, are dichromatic with two cone types. They can discriminate colors only in their upper visual field. In the corresponding ventral retina, however, most cones display the same spectral preference, thereby presumably impairing spectral comparisons. In this study, we systematically investigated the retinal circuits underlying mouse color vision by recording light responses from cones, bipolar and ganglion cells. Surprisingly, most color-opponent cells are located in the ventral retina, with rod photoreceptors likely being involved. Here, the complexity of chromatic processing increases from cones towards the retinal output, where non-linear center-surround interactions create specific color-opponent output channels to the brain. This suggests that neural circuits in the mouse retina are tuned to extract color from the upper visual field, aiding robust detection of predators and ensuring the animal's survival.

Files

"*Data_Cones*": This dataset contains data acquired using 2-photon imaging with iGluSnFR (Marvin et al., Nat Methods 2013) of mouse cone photoreceptors using a set of chromatic stimuli.

Variable name	Dim 1	Dim 2	Dim 3	Remarks
`BGW_Quality`	#ROIs			Quality index of blue/green/white full-field responses as defined in paper
`BGW_Traces`	#samples	#ROIs		Mean of all repeats of blue/green/white full-field responses
`BG_CS_Quality`	#ROIs			Quality index of blue/green center/surround responses as defined in paper
`BG_CS_Traces`	#samples	#ROIs		Mean of all repeats of blue/green center/surround responses
`RoiInfo`	#ROIs			Date, retina id (0: right, 1:left), scan field id, ROI id, ROI center in x dimension, ROI center in y dimension, zoom factor (72 µm for zoom factor of 1.0)
`RoiMasks`	128	128	#scans	ROIs used for each scan field, ordered like in `RoiInfo`

“*Data_BipolarCells*”: This dataset contains data acquired using 2-photon imaging with iGluSnFR of mouse bipolar cells using a set of chromatic stimuli and a standardized set of achromatic stimuli used for functional clustering (Franke, Berens et al., Nature 2017).

Variable name	Dim 1	Dim 2	Dim 3	Remarks
`ChirpQI`	#ROIs			Quality index of full-field chirp responses as defined in paper
`Chirp_Traces`	#samples	#ROIs		Mean of all repeats of full-field chirp responses
`LocalChirpQI`	#ROIs			Quality index of local chirp response as defined in paper
`LocalChirp_Traces`	#samples	#ROIs		Mean of all repeats of local chirp responses
`CS_Kernels`	#samples	4	#ROIs	Event triggered stimulus kernels as described in paper; column 0 and 2: UV and green center, respectively; column 1 and 3: UV and green surround, respectively
`CS_Events`	#samples	6	#ROIs	Stimulus triggered event kernels as described in paper; column 0 and 3: UV and green center, respectively; column 1 and 4: UV and green surround, respectively; column 2 and 5: UV and green full-field, respectively
`SineQI`	#ROIs			Quality index of sine responses as defined in paper; column 0/2: UV/green center, column 1/3: UV/green surround
`Sine_Traces`	#samples	#ROIs		Mean of all repeats of sine responses
`RoiInfo`	#ROIs			Date, retina id (0: right, 1:left), scan field id, ROI id, ROI center in x dimension, ROI center in y dimension, zoom factor x dimension (72 µm for zoom factor of 1.0), zoom factor z dimension (84 µm for zoom factor 1.0), distance from optic nerve nasal-temporal axis in µm, distance from optic nerve ventral-dorsal axis on µm, IPL depth
`RoiMasks`	64	56	#scans	ROIs used for each scan field, ordered like in `RoiInfo`

“*Data_RetinalGanglionCells*”: This dataset contains data acquired using 2-photon imaging with OGB-1 of mouse retinal ganglion cells using a set of chromatic stimuli and a standardized set of achromatic stimuli used for functional clustering (Baden, Berens, Franke et al., Nature 2016).

Variable name	Dim 1	Dim 2	Dim 3	Remarks
`ChirpQI`	#ROIs			Quality index of full-field chirp responses as defined in paper
`Chirp_Traces`	#samples	#ROIs		Mean of all repeats of full-field chirp responses
`BarsQI`	#ROIs			Quality index of moving bar responses as defined in paper
`Bars_Traces`	#samples	#directions	#ROIs	Mean of all repeats of moving bar responses
`Bars_pValues`	#ROIs			Direction tuning p value as defined in paper
`CS_Kernels`	#samples	4	#ROIs	Event triggered stimulus kernels as described in paper; column 0 and 2: UV and green center, respectively; column 1 and 3: UV and green surround, respectively
`CS_Events`	#samples	6	#ROIs	Stimulus triggered event kernels as described in paper; column 0 and 3: UV and green center, respectively; column 1 and 4: UV and green surround, respectively; column 2 and 5: UV and green full-field, respectively
`Group_Assign`	#ROIs			Group numbers as in Baden, Berens, Franke et al., Nature 2016: 1-28 retinal ganglion cells, 29-32 uncertain, 33-46 amacrine cells
`RoiInfo`	#ROIs			Date, retina id (0: right, 1:left), mouse id, scan field id, ROI id, ROI center in x dimension, ROI center in y dimension, zoom factor x dimension (72 µm for zoom factor of 1.0), distance from optic nerve nasal-temporal axis in µm, distance from optic nerve ventral-dorsal axis on µm
`RoiMasks`	64	64	#scans	ROIs used for each scan field, ordered like in `RoiInfo`