

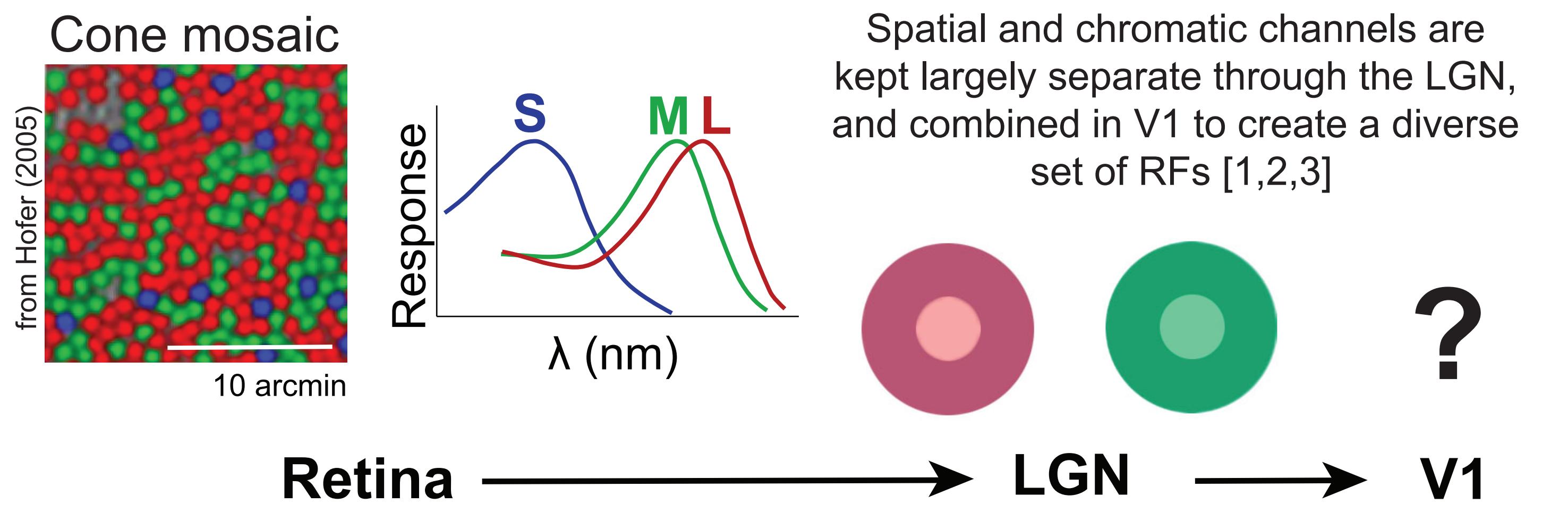


The spatial scale of chromatic processing of macaque V1 receptive fields at the center-of-gaze

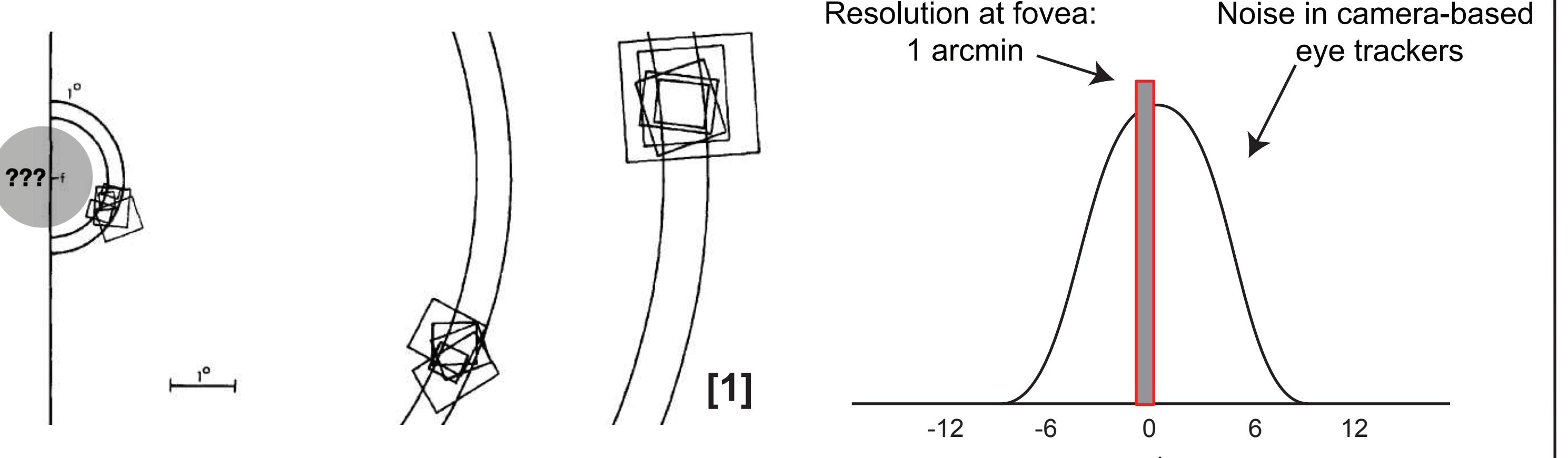
Background

How does cortex process high-acuity vision?

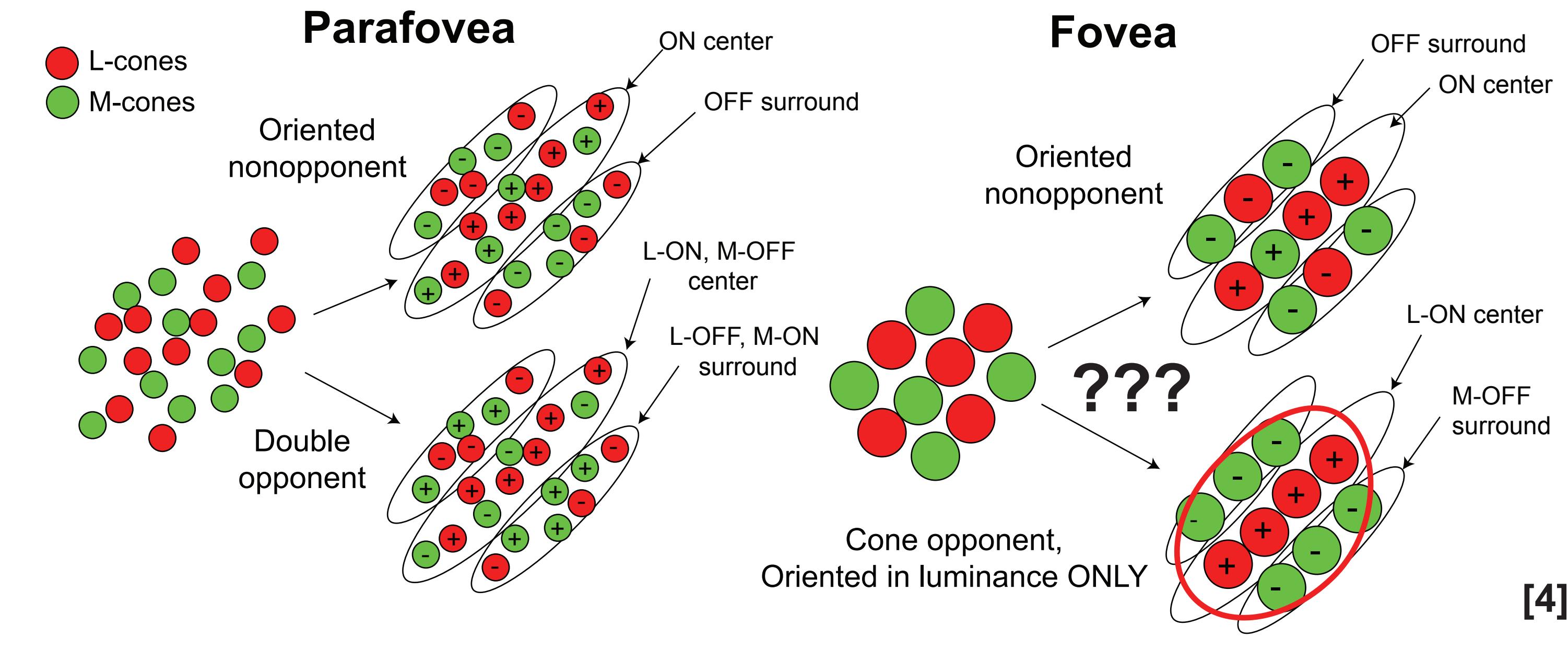
High-acuity vision occurs at the fovea, in the center 1° of visual angle.
Pre-cortical circuitry processes inputs at cone resolution (1 arcmin or 1/60°)



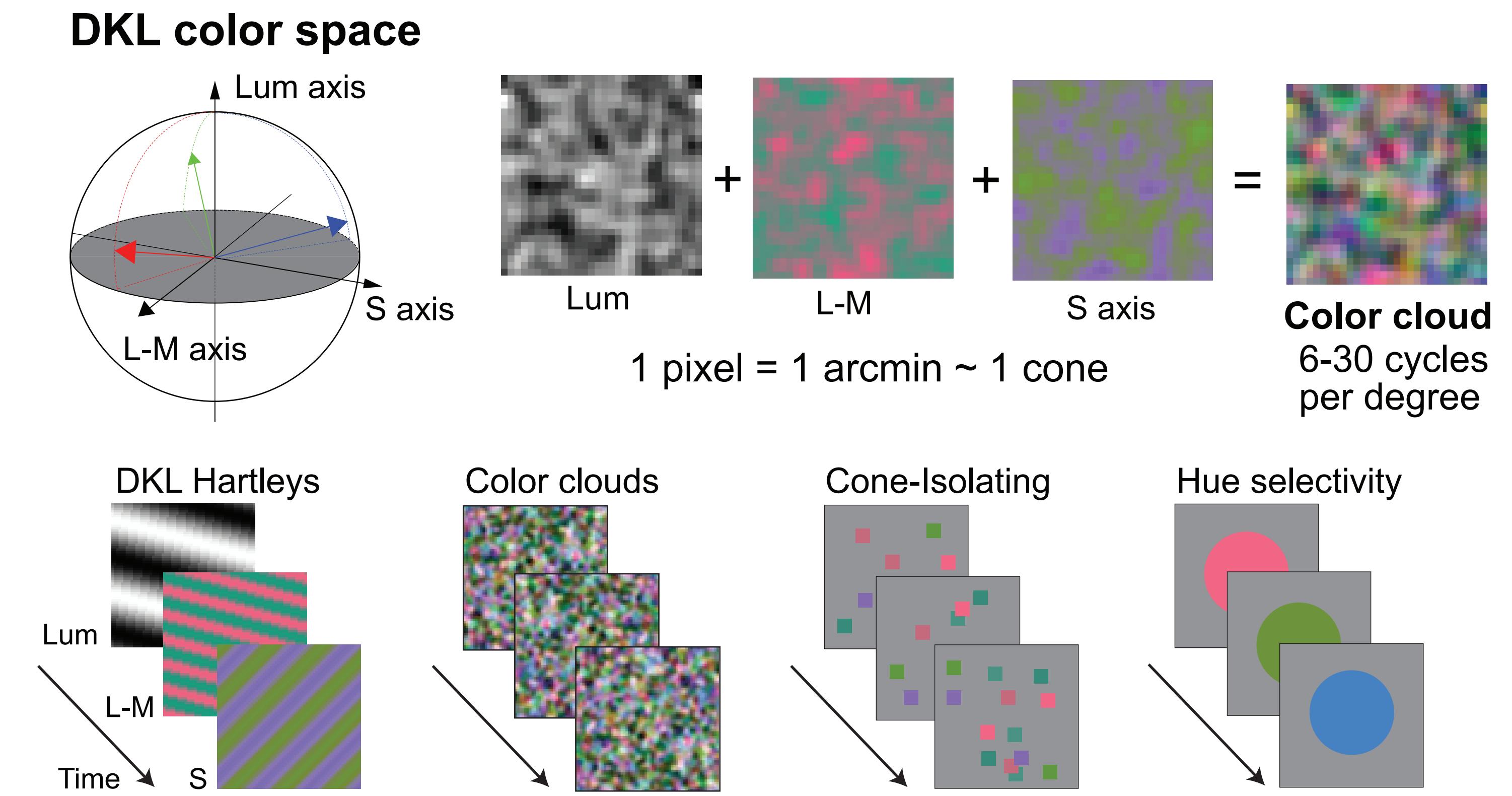
Foveal V1 is largely unstudied



Is spatial and chromatic information combined at the same scale in foveal V1?



Spatio-chromatic stimuli

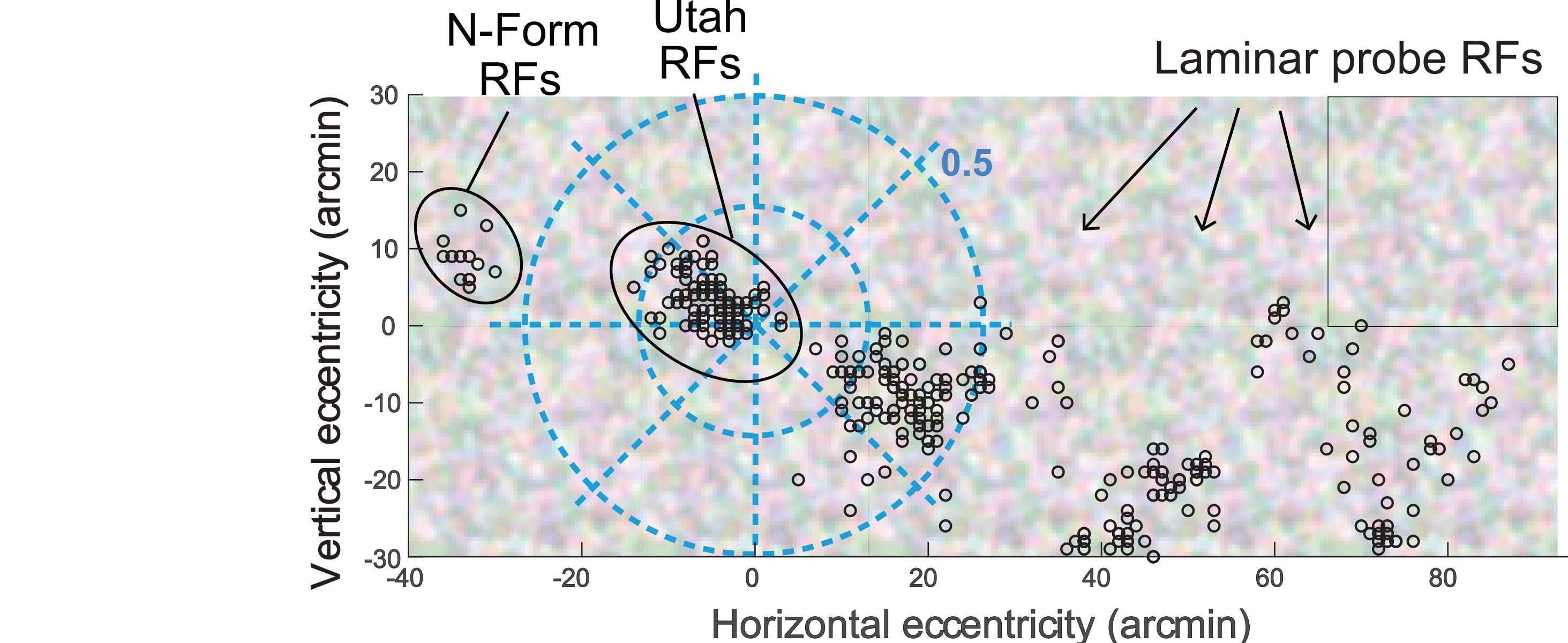


References

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- [2] Conway BR (2001) Spatial structure of cone inputs to color cells in alert macaque V1. *J Neurosci* 21: 2768-83.
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- [5] McFarland JM, Bondy AG, Cumming BG, Butts DA (2014) High-resolution eye tracking using V1 neuron activity. *Nat Commun* 5: 1-12.
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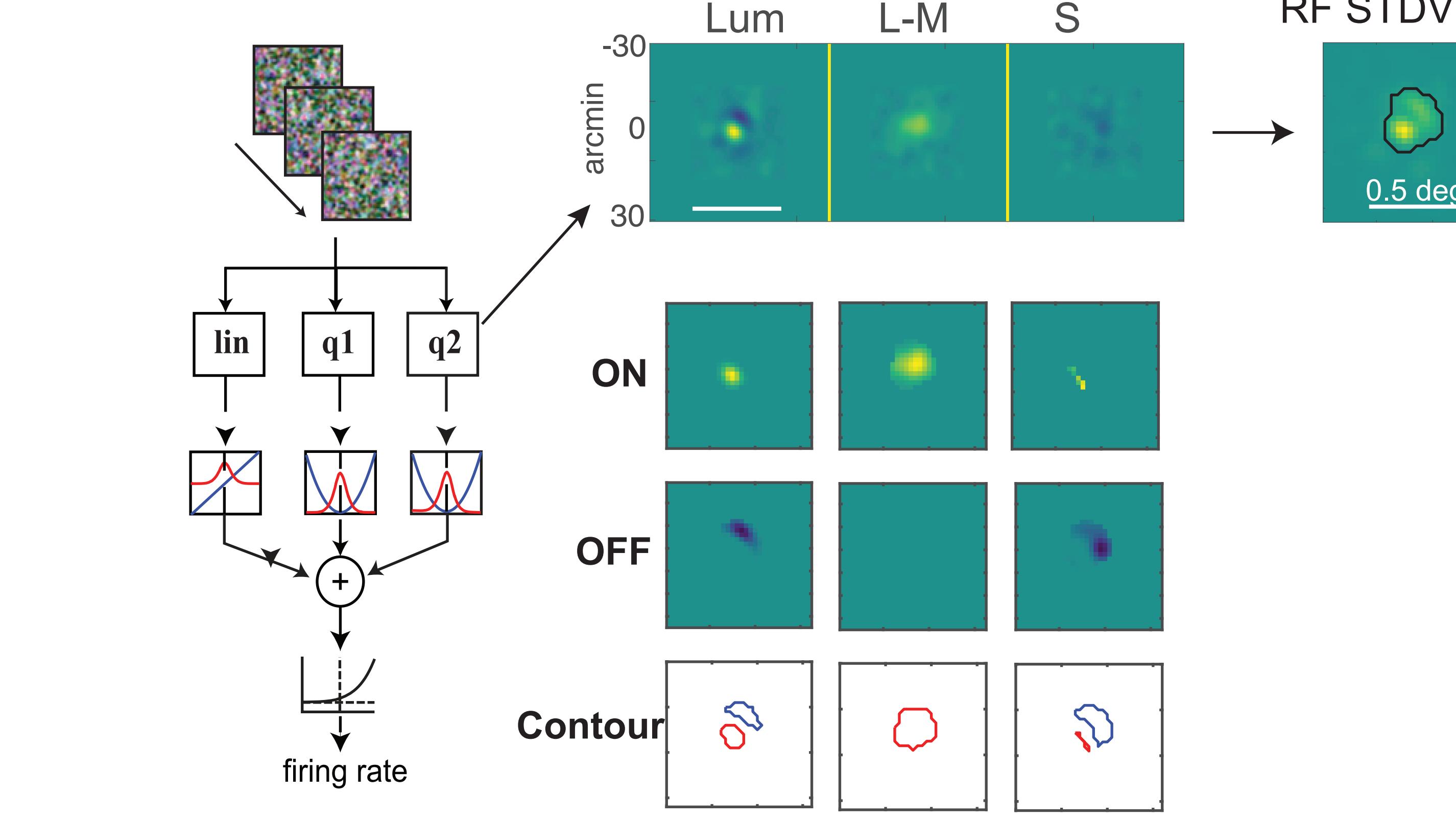
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Large-scale recordings from foveal V1

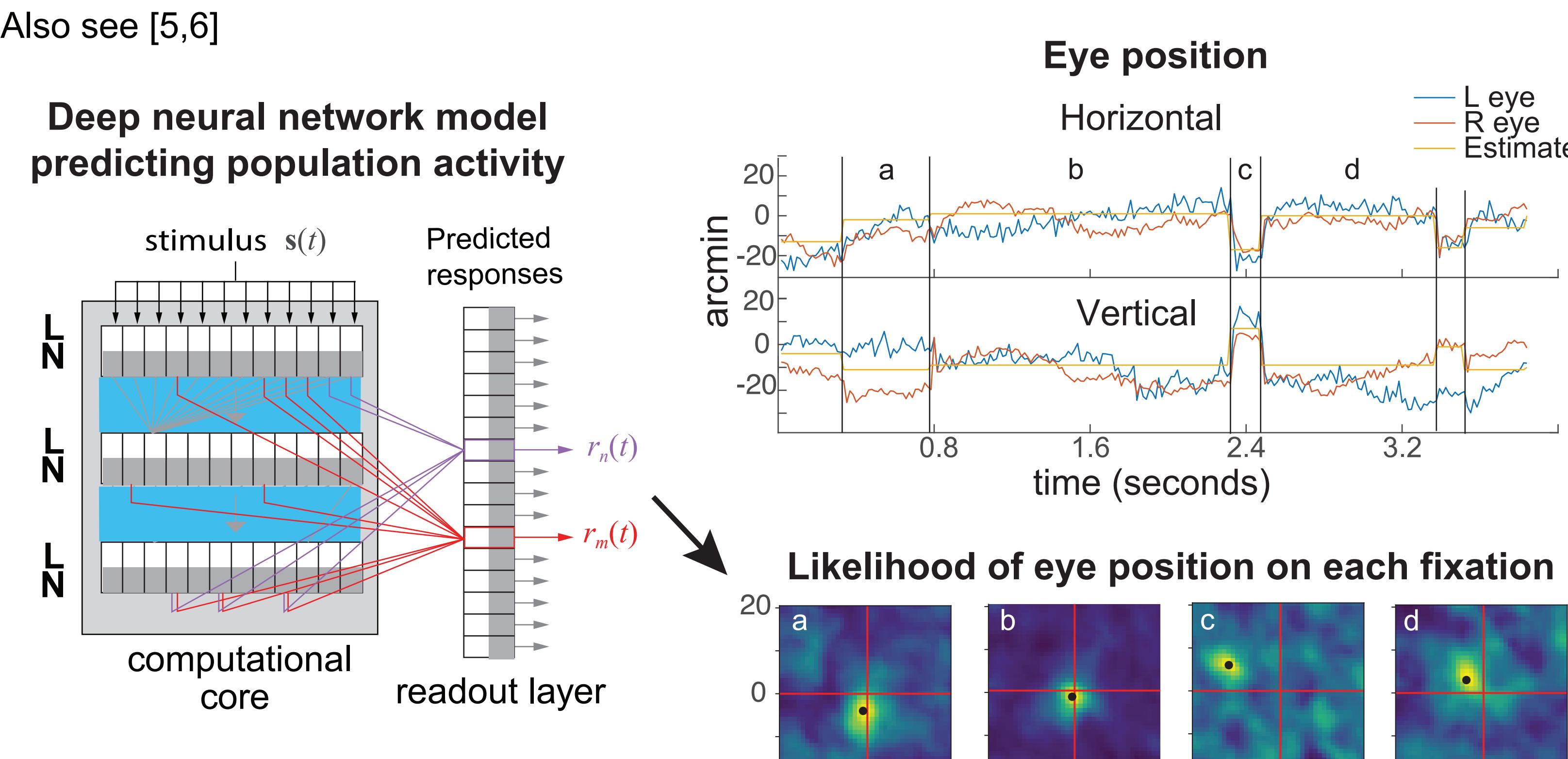


Acute laminar probe: to sample different cortical columns
Chronic large-scale arrays: to support model-based eye-tracking
Plexon V-probe: 24 contacts, 50 μ m spacing
Utah array: 96 contacts, 10x10, 400 μ m spacing
Plexon N-form array: 100 contacts, 16 shanks
*fovea

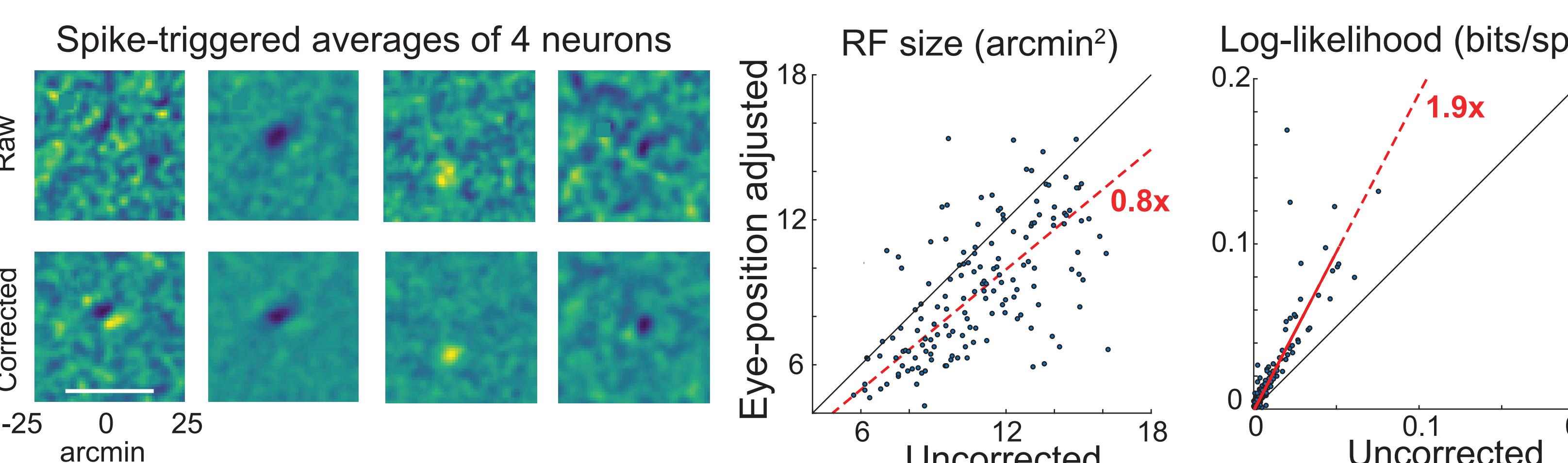
Model-based characterization of selectivity



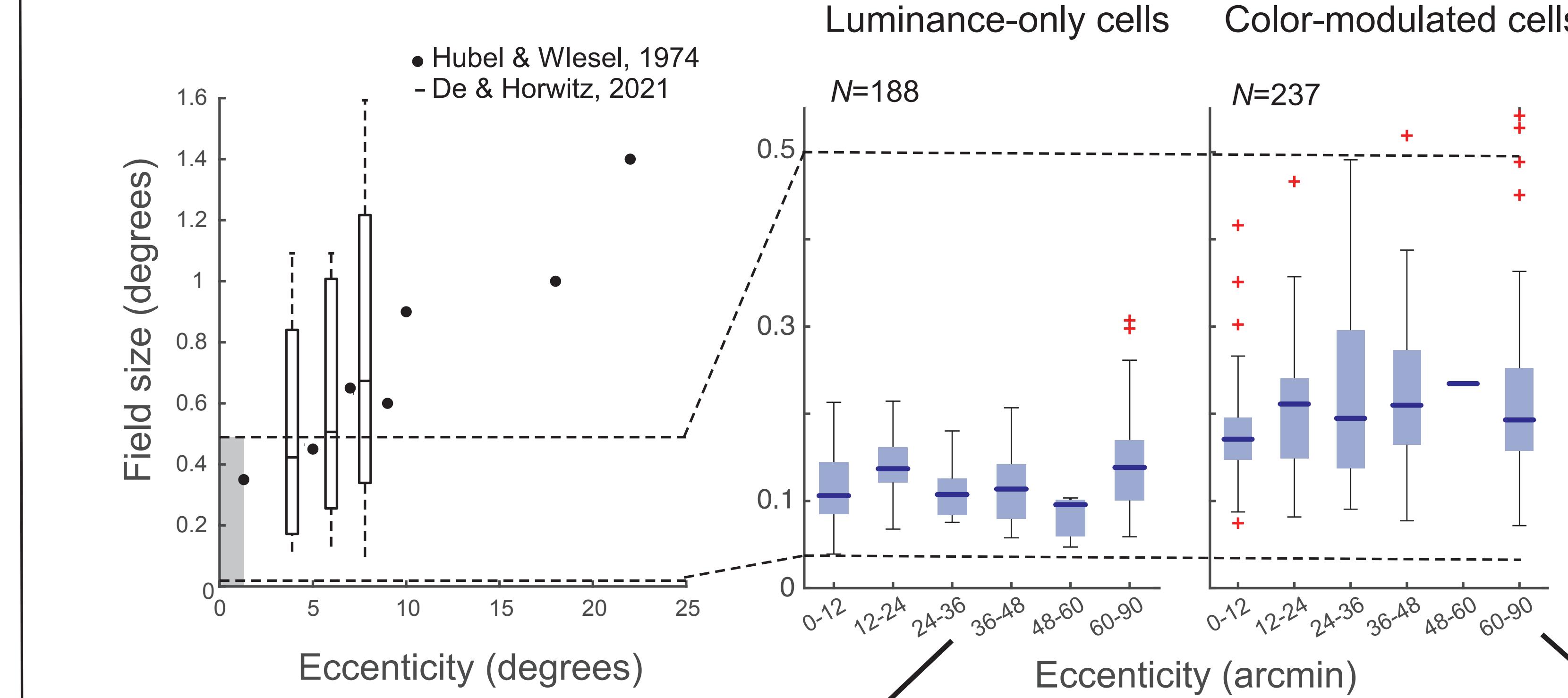
Neurophysiological eye tracking



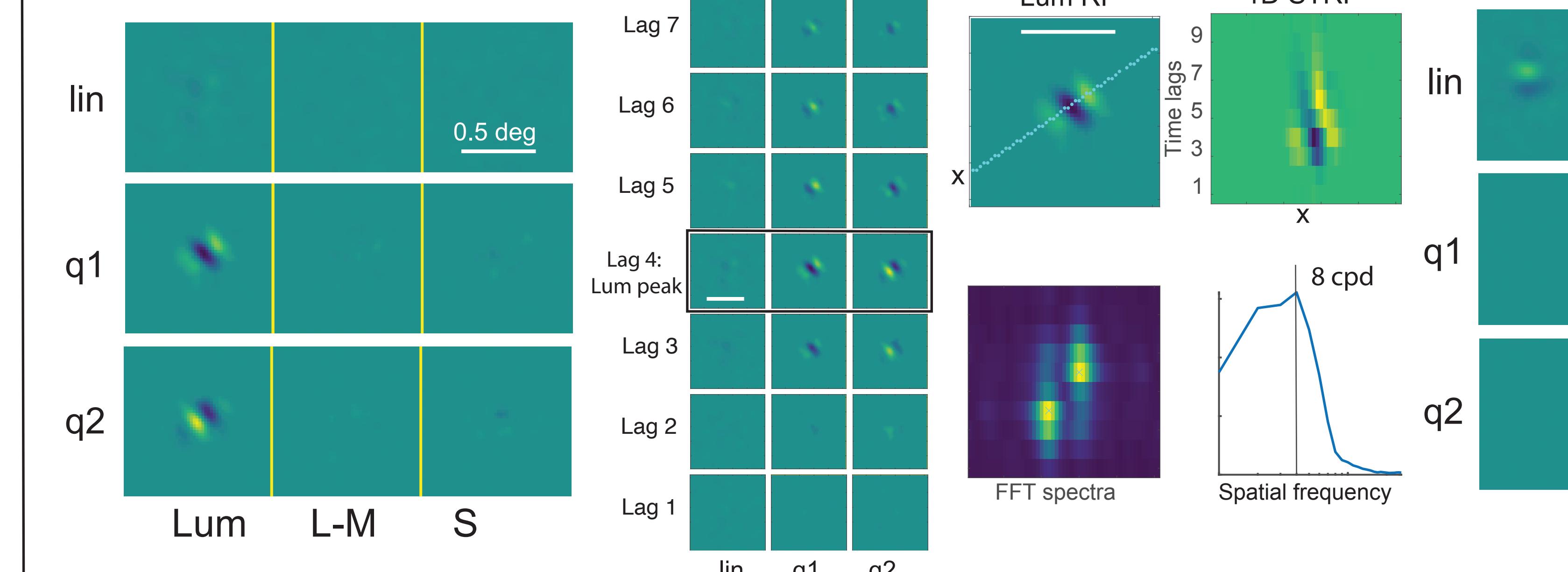
Effect of eye-position correction on receptive fields



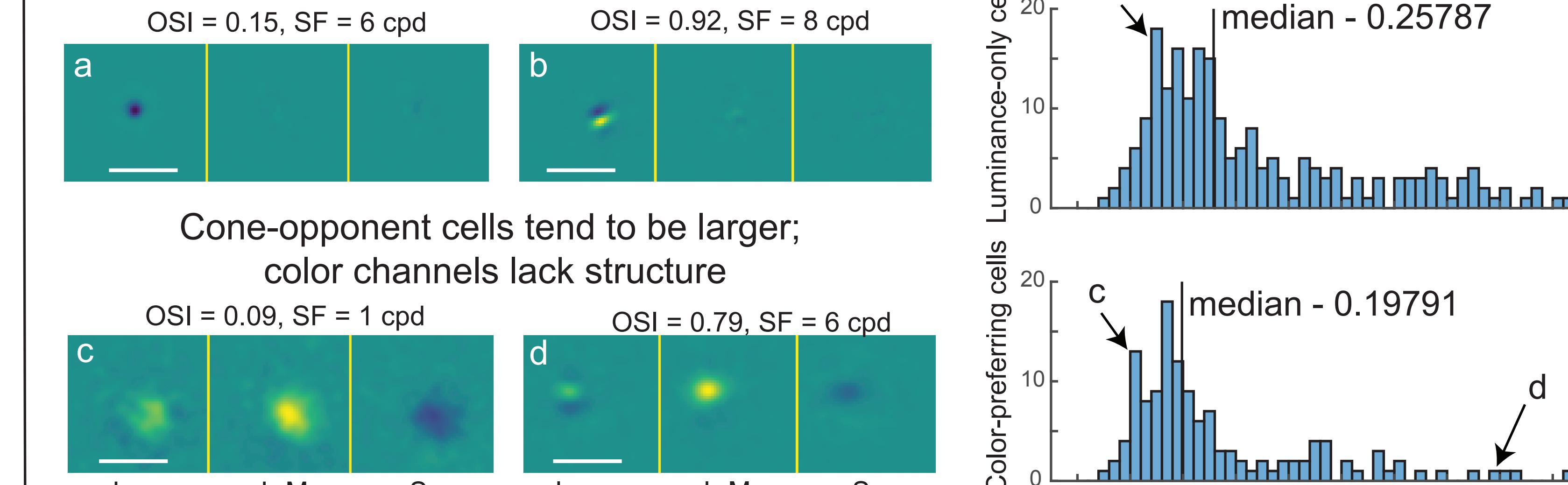
Dichotomy between luminance and color



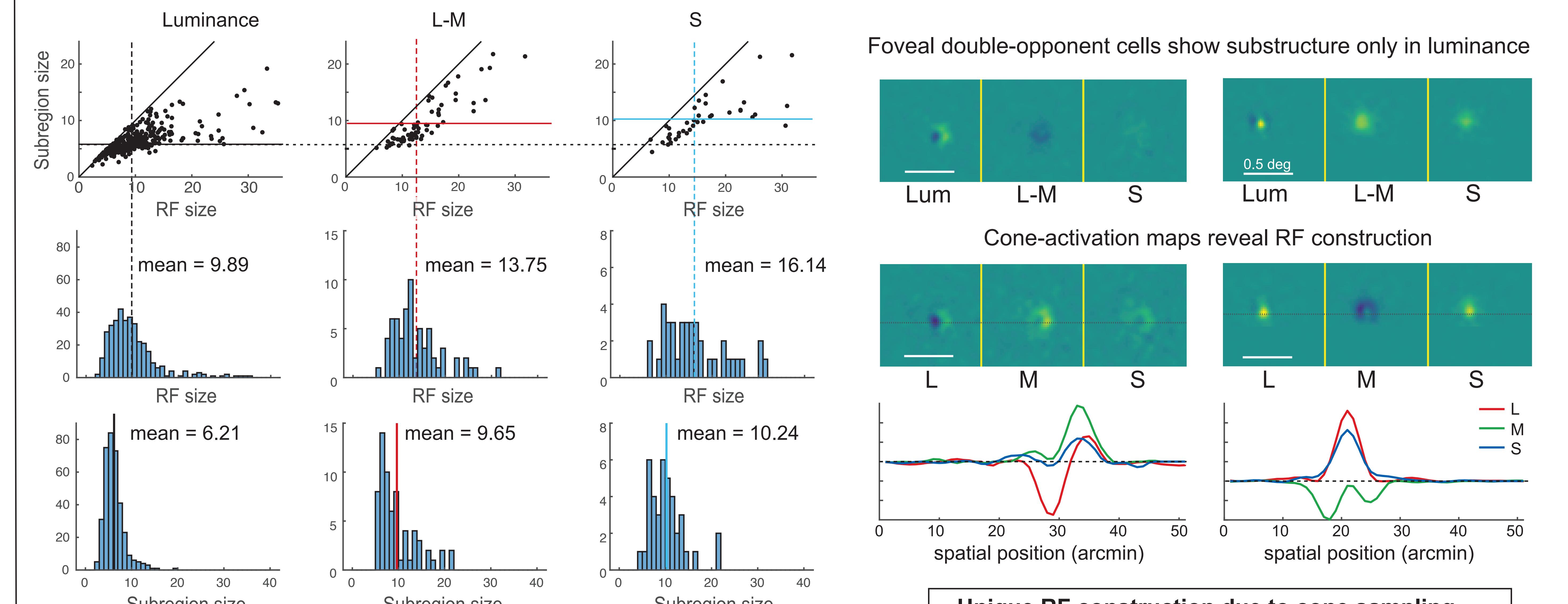
High-resolution luminance



Same resolution via monophasic or Gabor-like RFs



Finer RF substructure in luminance than color

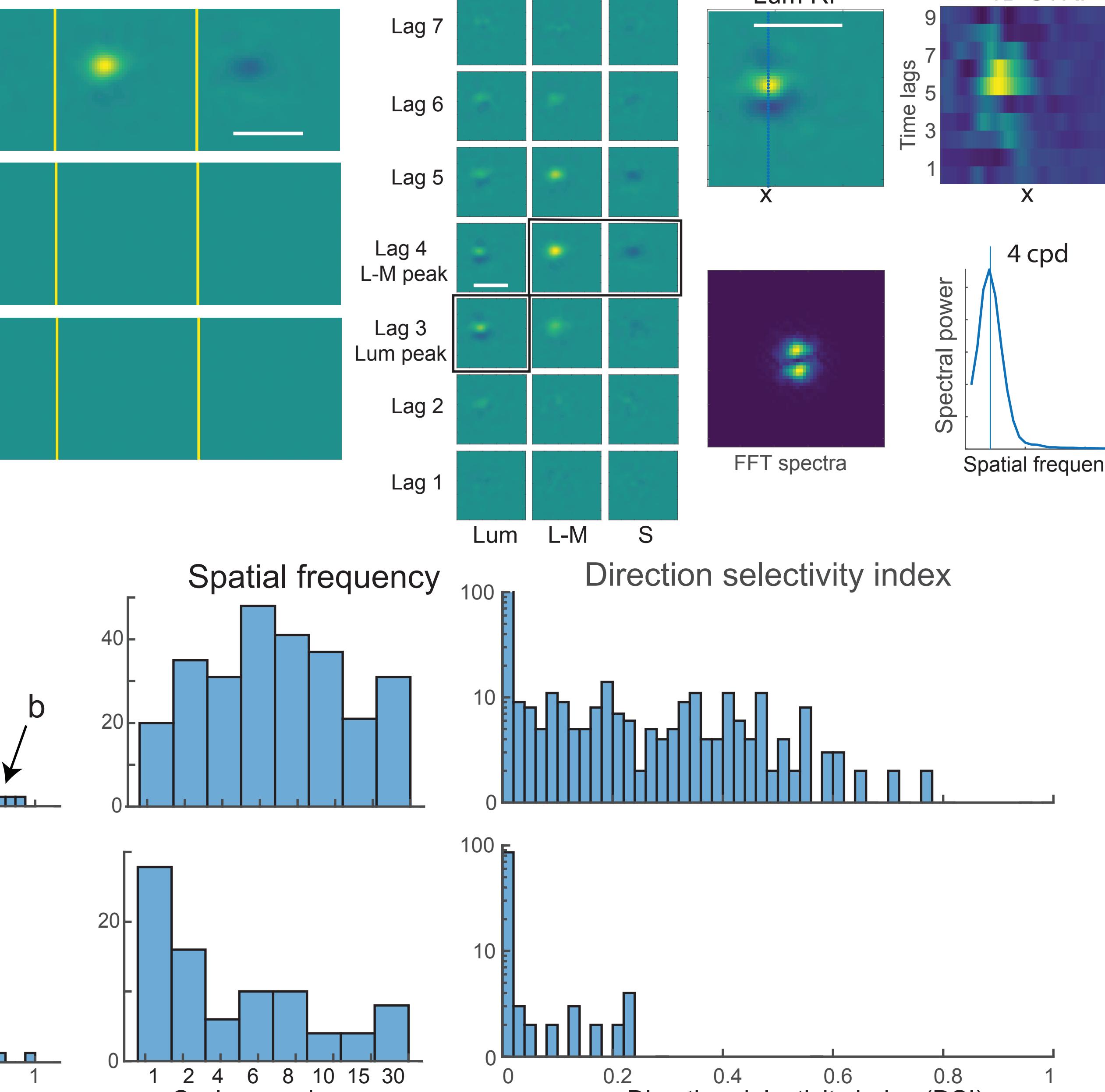


All values are shown for cells with significant tuning in the respective channel (weight > 0.3)

Conclusions

- We present estimates of the resolution of receptive fields in foveal V1 in macaque
- Luminance-only cells carry the highest-resolution information in V1, (median RF width = 0.1°)
- RF size does not discernably increase across foveal eccentricities
- Color-modulated cells tend to integrate over larger areas
- Even luminance-only cells with large RFs maintain high resolution via finer subregions

Low-resolution color



Unique RF construction due to cone sampling constraints in the fovea