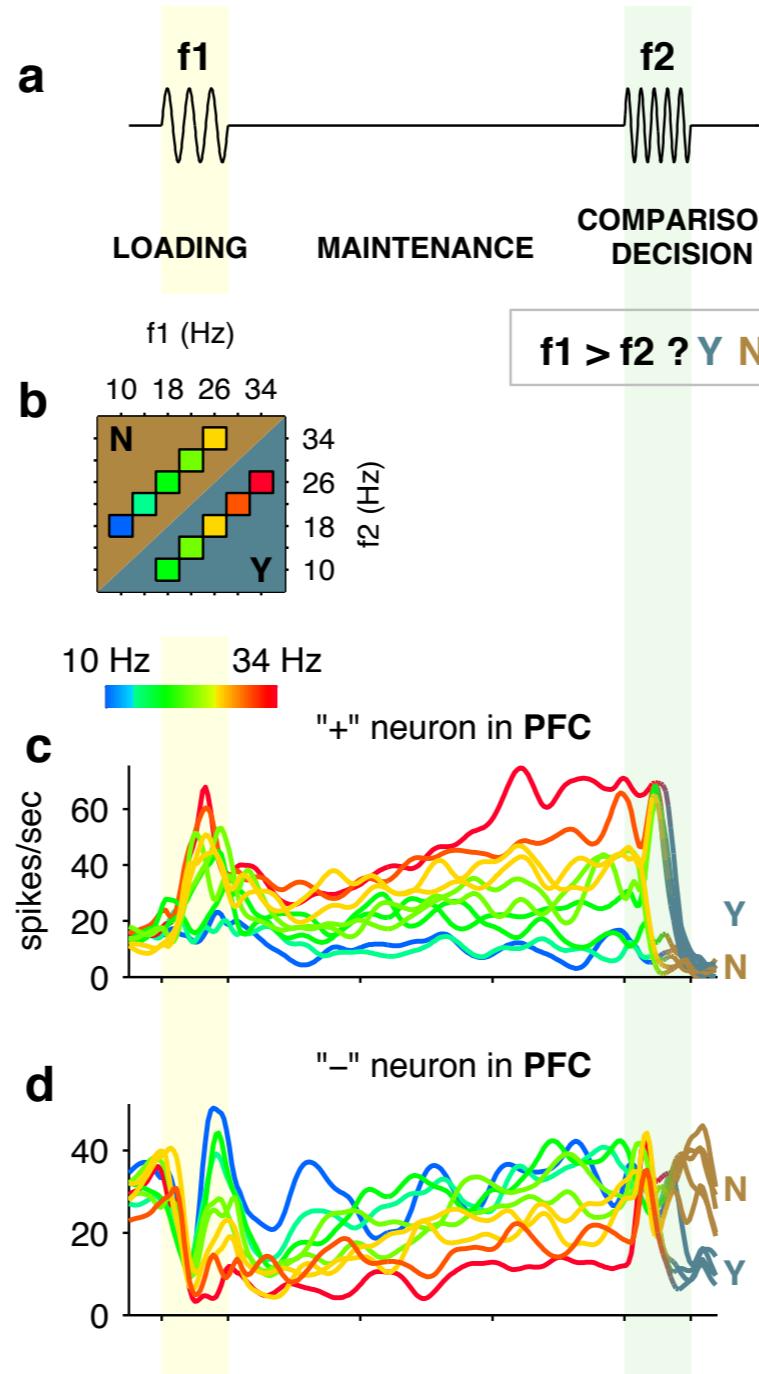


Working Memory and Continuous attractor models

A parametric working memory task



Persistent activity in neurons encoding eye position

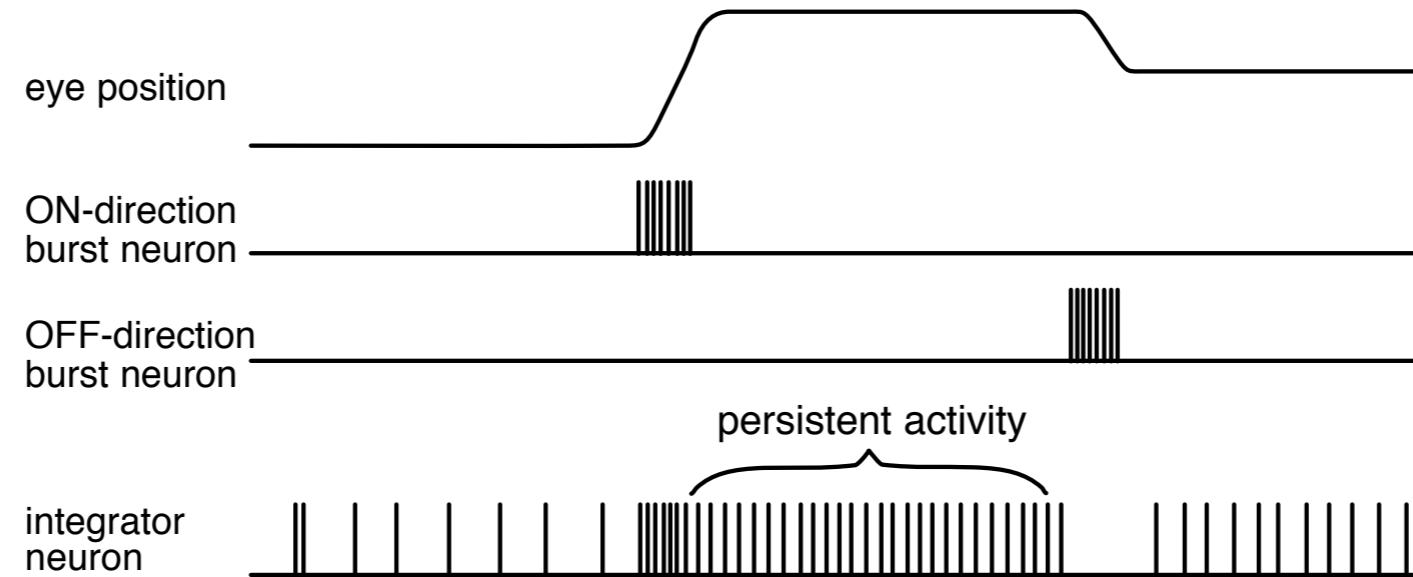
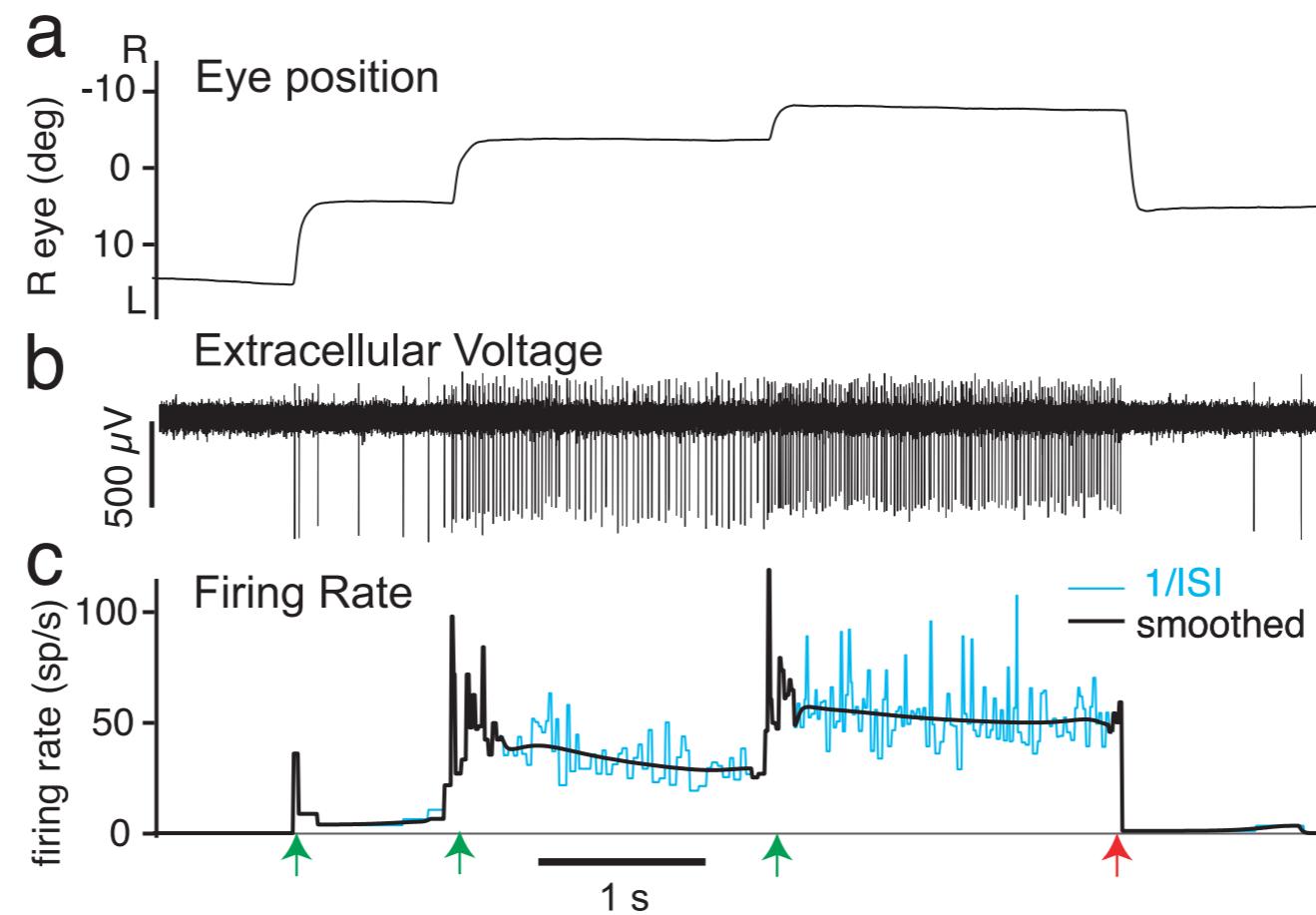
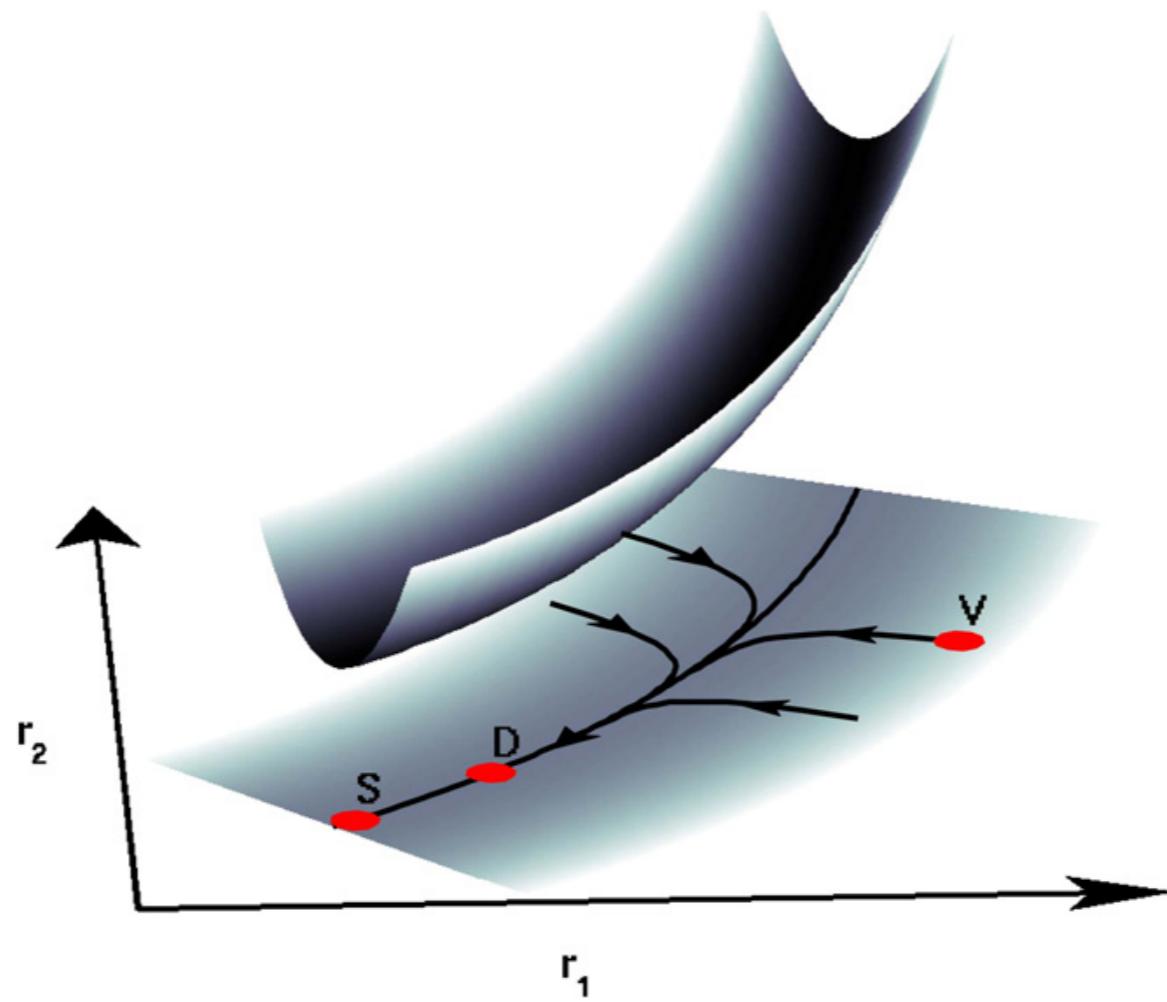


Figure 7.7: Cartoon of burst and integrator neurons involved in horizontal eye positioning. The upper trace represents horizontal eye position during two saccadic eye movements. Motion of the eye is driven by burst neurons that move the eyes in opposite directions (second and third traces from top). The steady-state firing rate (labeled persistent activity) of the integrator neuron is proportional to the time integral of the burst rates, integrated positively for the ON-direction burst neuron and negatively for the OFF-direction burst neuron, and thus provides a memory trace of the maintained eye position. (Adapted from Seung et al., 2000.)

Persistent activity in neurons encoding eye position

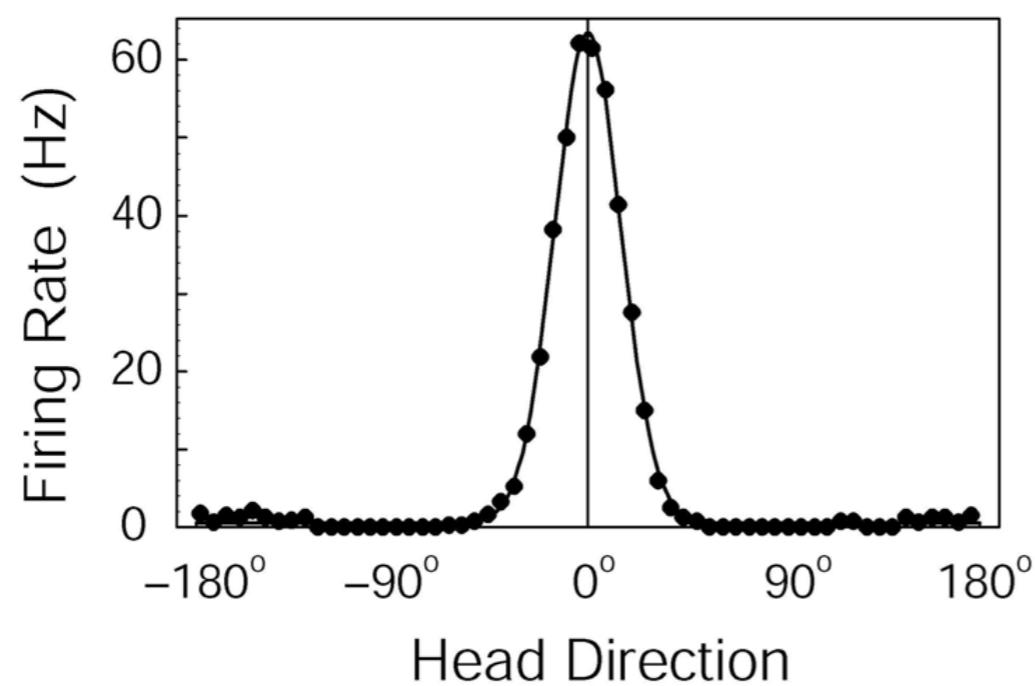


One dimensional dynamics

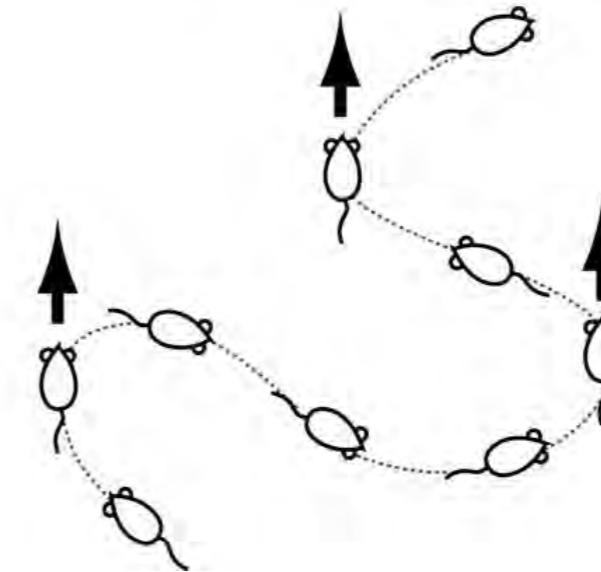


Head direction cell

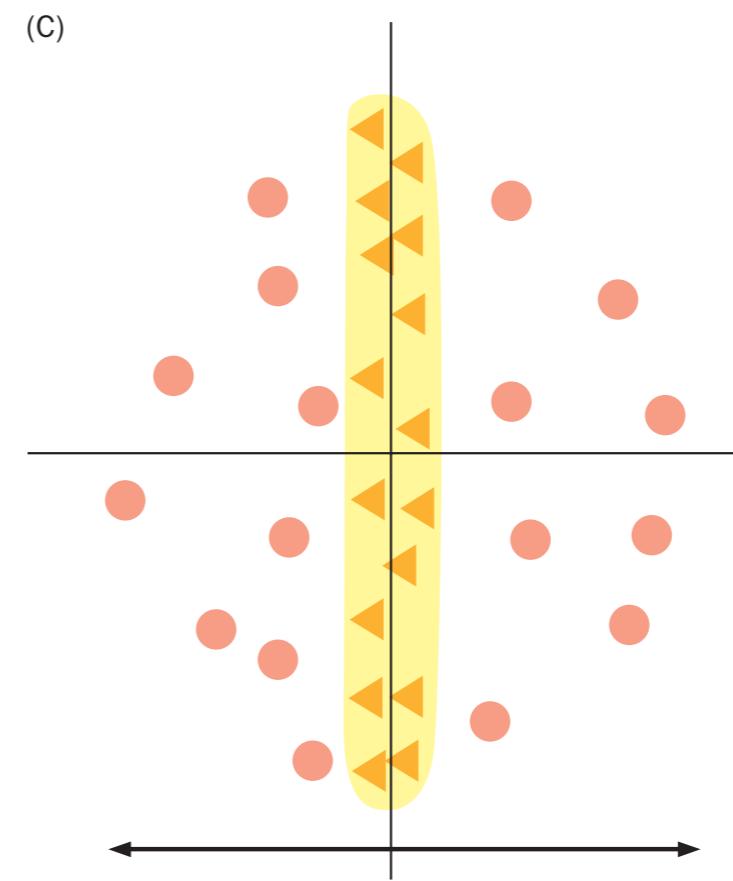
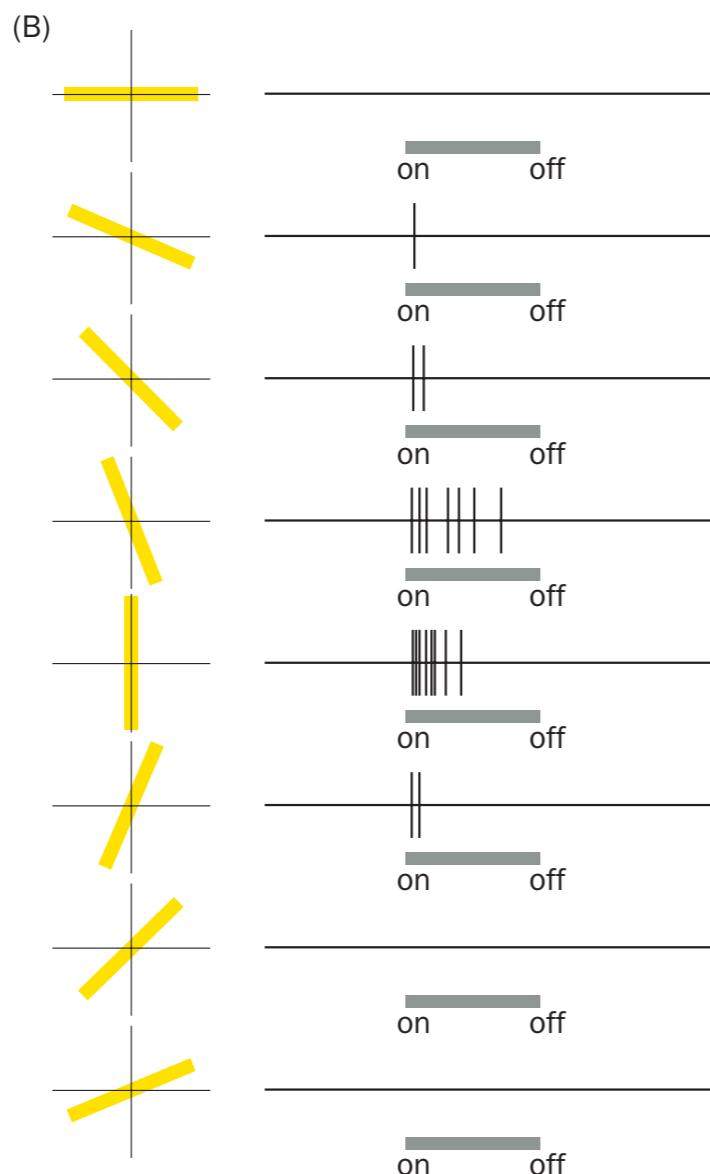
Tuning Curve of a Head-Direction Cell



Preferred Direction of a Single Head-Direction Cell

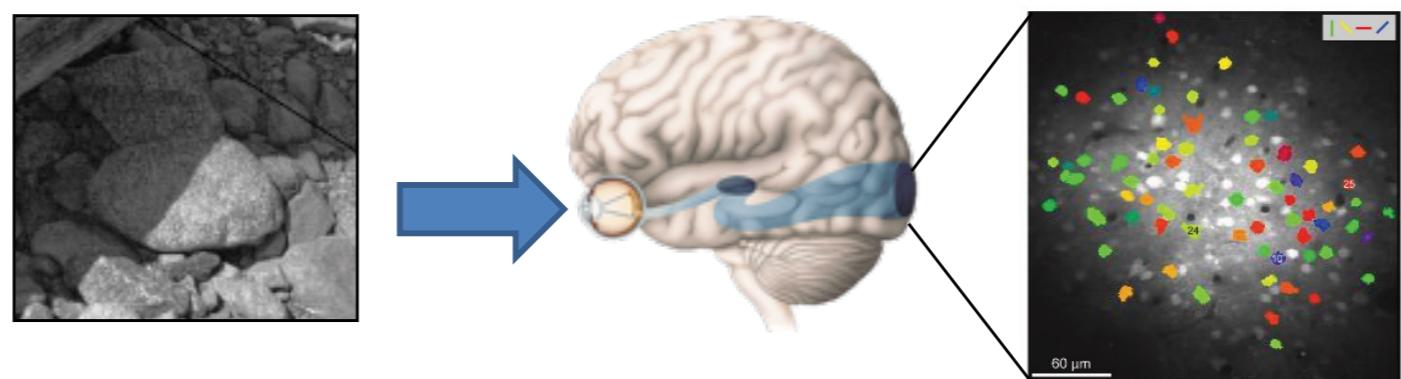


Simple cell receptive field in the cat primary visual cortex

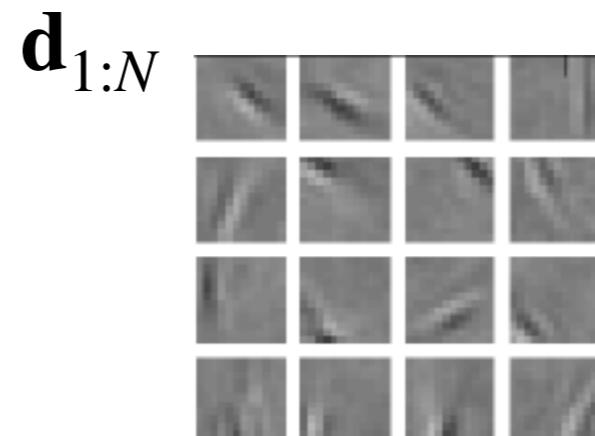


Hubel and Wiesel, 1959 Journal of Physiology

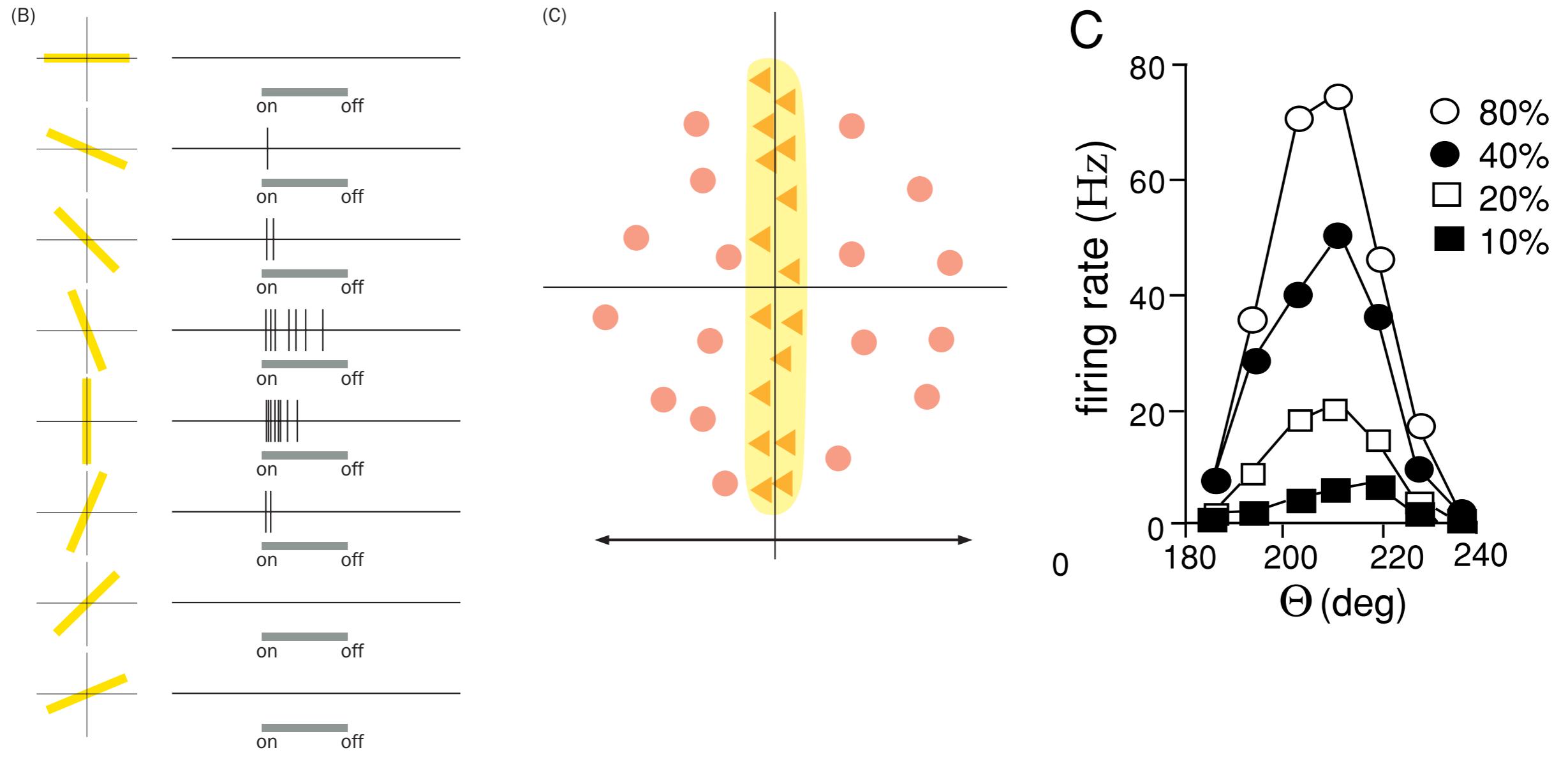
Working memory and sensory representation



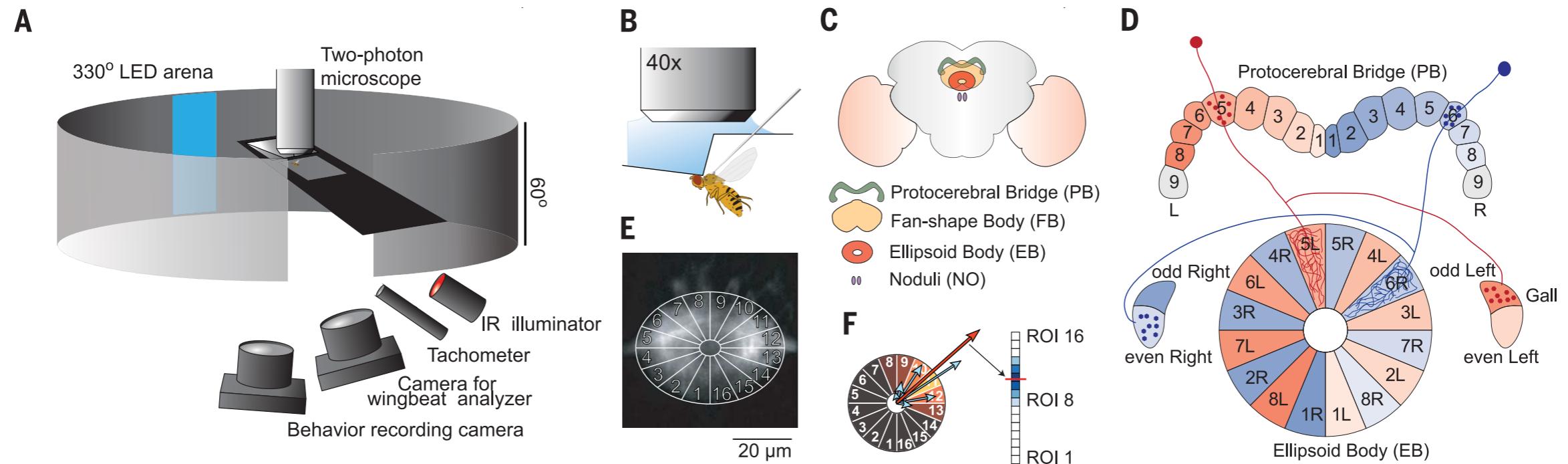
$$\mathbf{s} \approx \sum_{i=1}^N r_i(t) \mathbf{d}_i$$



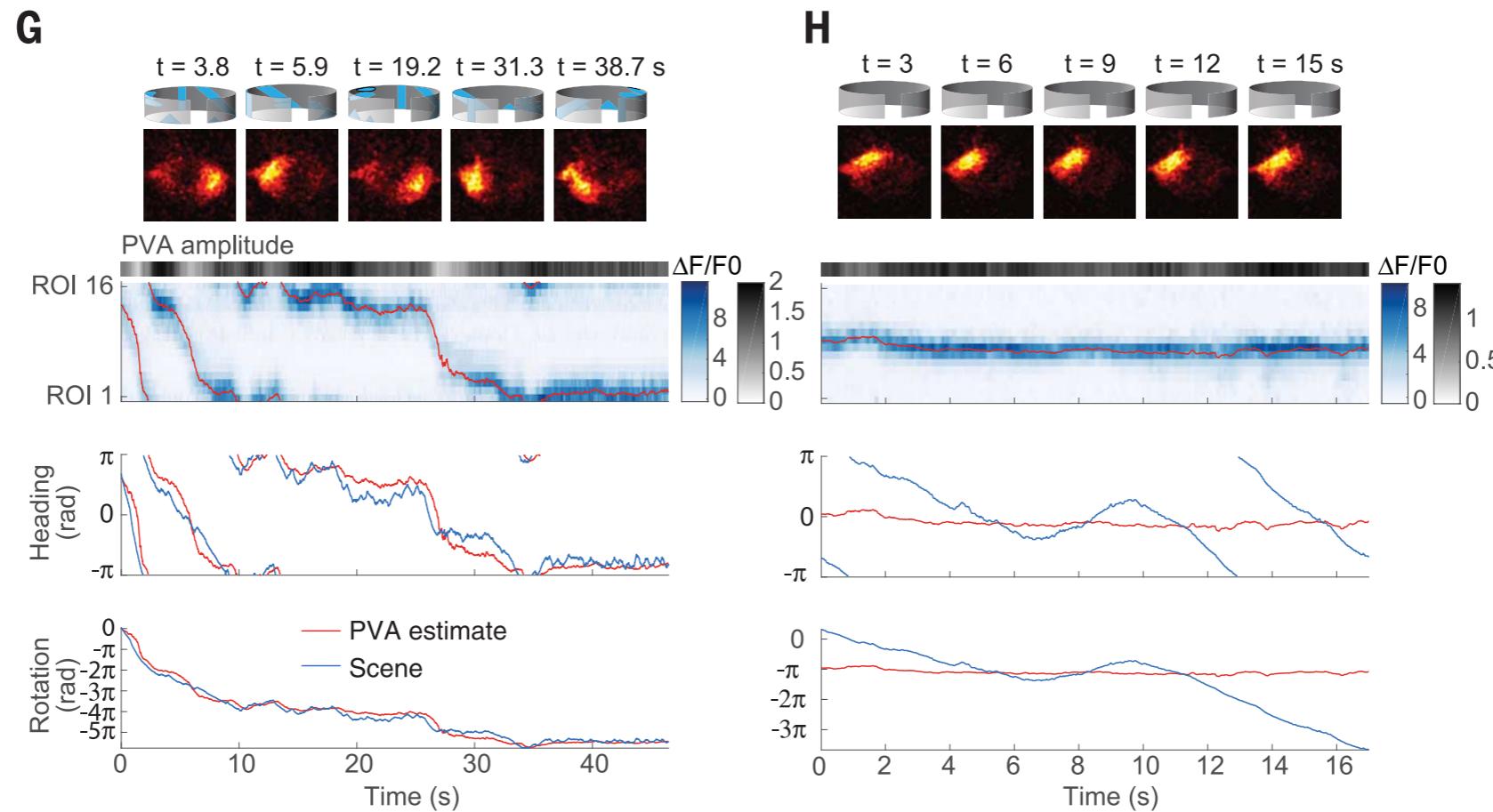
Contrast dependent receptive field



Ring attractor dynamics in fly brain



Ring attractor dynamics in fly brain



Ring attractor dynamics in fly brain

