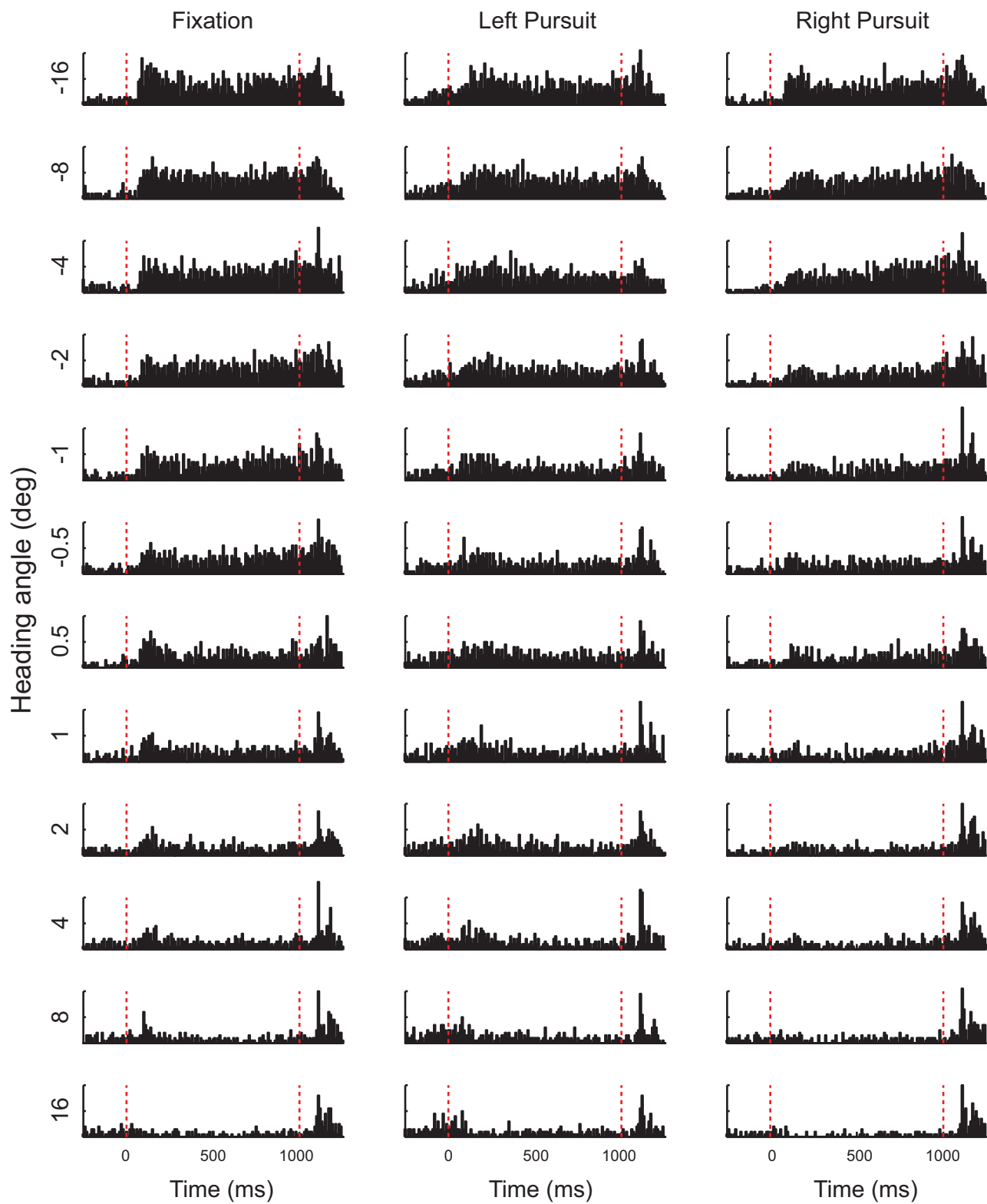
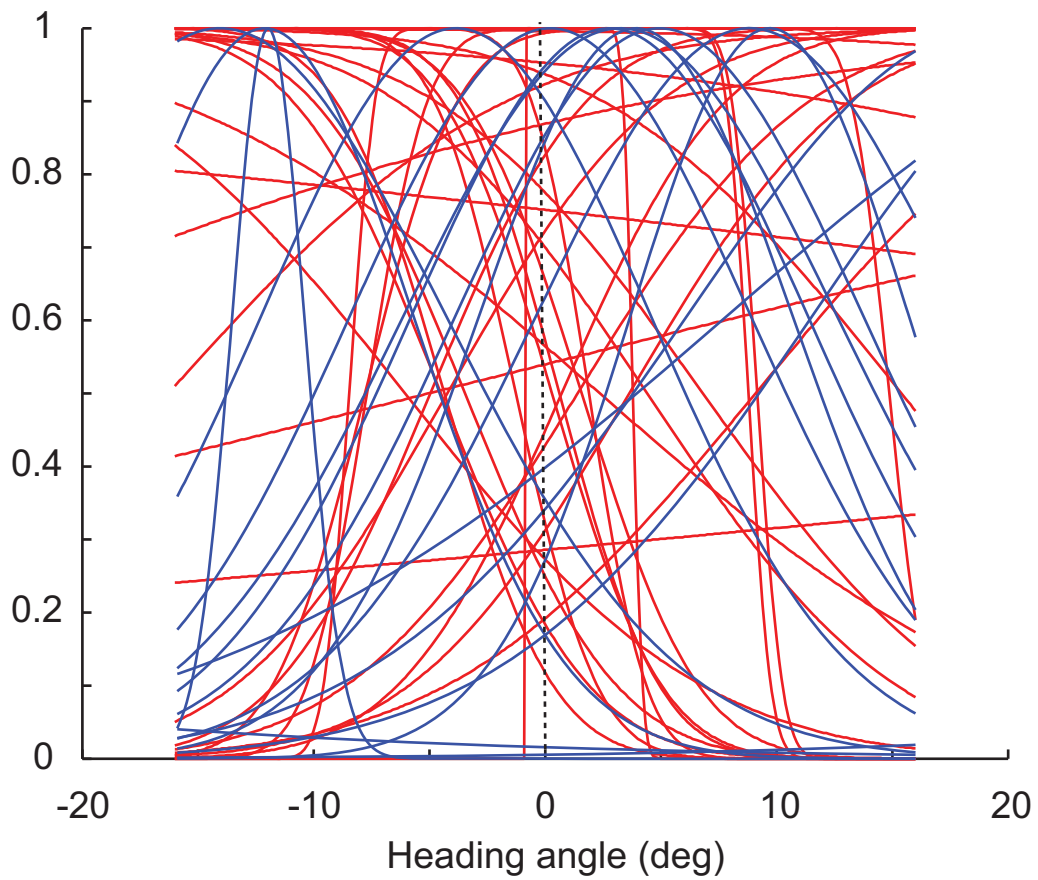


Supplementary Figure 1. Spike rasters from a single example cell. Each dot represents a spike, and each line is a complete trial. Red dashed lines depict the start and end times of the simulated trajectory.

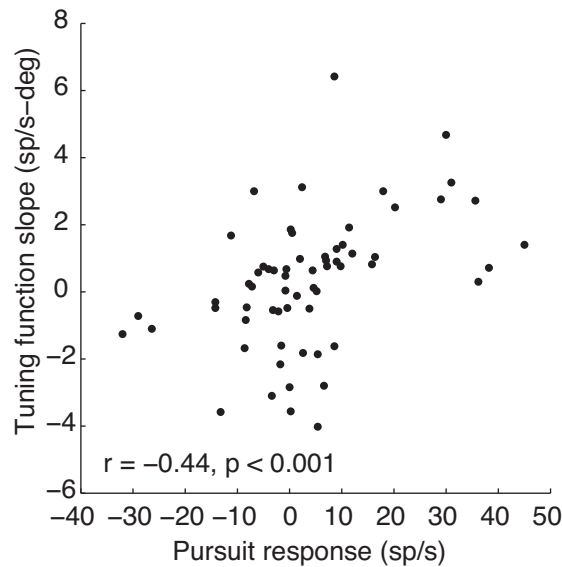


Supplementary Figure 2. Peristimulus time histograms from the same cell shown in Supplementary Figure 1.

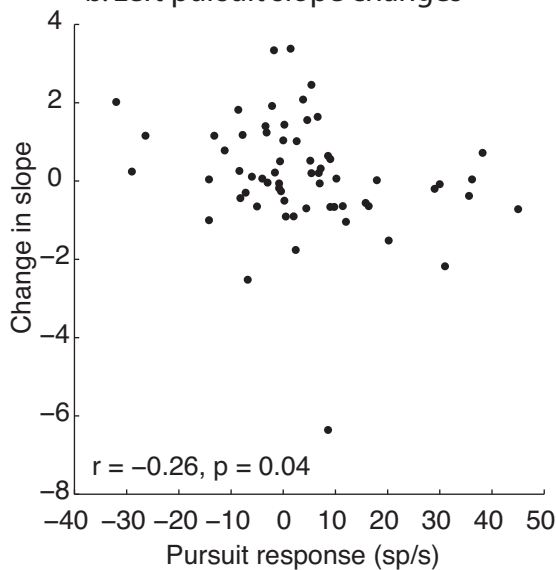


Supplementary Figure 3. Best-fit tuning functions of all cells. Those that were fit better with a probit are shown in red, and those that were better fit with a Gaussian in blue. Amplitudes were normalized.

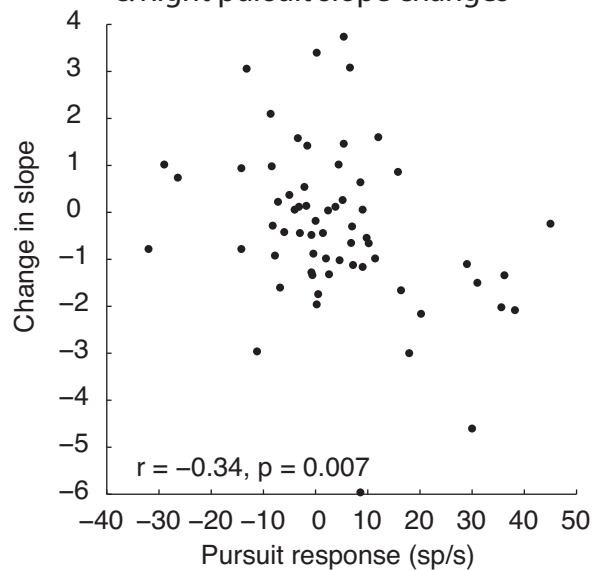
a. Pursuit responses predict heading preference



b. Left pursuit slope changes



c. Right pursuit slope changes



Supplementary Figure 4. Influence of explicit signals of pursuit. These 63 cells were from the sample studied by Zhang et al, 2004. As a proxy for our current analysis of sensitivity, we used the slope of the neuronal response function across the central 3 headings: -5, 0, and 5 degrees. Pursuit responses were measured in darkness for 1 sec while the monkey pursued a target moving 10 deg/s horizontally. Net pursuit response was defined as the difference between right and left pursuit response. Cells preferring right pursuit tended to prefer right headings, and thus leftward retinal flow (a). In both pursuit directions, the presence of pursuit responses was significantly correlated with a reduction in response function slope (b and c).