

NEURAL CORRELATES OF PURSUIT AND SACCADE EYE MOVEMENT  
CHOICES IN THE PRIMATE SUPERIOR COLLICULUS

Rich Krauzlis and Natalie Dill, Systems Neurobiology Laboratory, Salk Institute for Biological Studies, La Jolla, CA 92037 U.S.A., email: rich@salk.edu

Primates continuously resample their visual environment through a combination of slow pursuit and quick saccadic eye movements. Such frequent movements require timely choices by both pursuit and saccades about which stimulus to target next. These choices likely involve identifying the most active neurons among those representing the competing alternatives, but it is unknown how this “winner-take-all” strategy is coordinated between the two movements. We have now examined the role of the superior colliculus in choosing targets for pursuit and saccades by comparing neuronal activity at sites representing the possible choices and have found that the “winner” can be predicted by the difference in activity between the neuronal populations. After recording during a two-alternative forced-choice paradigm, we measured the difference in activity of the populations representing the two choices by computing ROC curves on a millisecond timescale. A signal indicating the correct choice emerged from noise over time, forming a tradeoff between speed and accuracy. The observed eye movement choices corresponded to particular points along the predicted speed-accuracy curves – pursuit emphasizing speed and saccades emphasizing accuracy. Our results show that activity from the same set of neurons in the superior colliculus can predict both pursuit and saccade eye movement choices, and that applying different decision criteria to a common pool of information is a possible strategy for coordinating the outputs from different motor systems.