The Neuroscience Graduate Program presents:

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IN A PHD THESIS DEFENSE

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Contributions of Striatum and Orbitofrontal Cortex to Flexible Rule-Based Decision Making

The brain's reward system is often distinguished, both functionally and anatomically, from its executive control system. While reward processing is most often attributed to the orbital surface of the cortex and the ventral and medial parts of the striatum, executive control is most often attributed to dorsal and lateral structures (especially dorsomedial and dorsolateral prefrontal cortex). Recent research, however, suggests that the orbitofrontal cortex (OFC) and its striatal targets may also contribute to executive processes, such as flexible, rule-based decision-making, but their respective contributions are largely unclear. We hypothesized that OFC and its striatal targets contribute to flexible decision-making by maintaining representations of task requirements and signaling changes in task requirements. To test these hypotheses, we examined the relationship between firing rates of single neurons in OFC and two striatal regions, dorsal (DS) and ventral (VS) striatum in a modified version of the Wisconsin Card Sorting Task. We observed changes in firing rate when monkeys switched rules, and found significant encoding of rules and rule categories in all three brain regions. Crucially, we found that switch- and rule-related neural representations could not be attributed to reward processes, such as reward expectation or representation of stimulus-reward associations. Taken together, these results challenge the common notion that OFC and its striatal targets contribute only to simple reward or value related functions and instead endorse the hypothesis that these regions influence choice by forming and maintaining a multidimensional map of task space.