**Presenter:** Tomas Aquino

**Title:** Correlating human vmPFC neurons with value and uncertainty in the explore-exploit dilemma

**Author(s):** Tomas G. Aquino, Jeffrey Cockburn, Adam Mamelak, Ueli Rutishauser, John O'Doherty

**Abstract:** Understanding how the brain resolves the exploration/exploitation trade-off is a fundamental question in cognitive and decision neuroscience. However, little is known about how the brain resolves this dilemma at the level of single neurons even in animal models, let alone in humans. We obtained high quality single neuron recordings from the ventromedial prefrontal cortex of the human brain while n=21 epilepsy patients played a gambling task involving trade-offs between exploring uncertain options vs. exploiting well-known options. We recorded putative neurons from vmPFC, amygdala, dACC, pre-SMA and hippocampus with depth microelectrodes. We quantified patient behavior with reinforcement learning models to estimate how choices were driven by uncertainty, novelty, and q-values for each subject. A significant proportion of vmPFC neurons correlated with expected rewards and uncertainty during decision periods, as well as received outcomes. A significant proportion of amygdala neurons also correlated with uncertainty. This data provides direct evidence for value signals at the level of single neurons in the human vmPFC in balancing exploration and exploitation during decision-making.