

## Principles and Mechanisms of Adaptive Decision-Making

*Our understanding of how the brain makes decisions has been built largely on a theoretical framework with origins in the codebreaking work of Alan Turing and colleagues during WWII. This framework, which involves accumulating uncertain evidence until reaching a pre-defined bound, has numerous appeals, including: 1) close links optimization principles, 2) the ability to account for a broad range of behavioral findings, and 3) relatively direct mappings onto certain features of brain activity. However, this framework also has serious limitations, including direct relevance to only highly restricted and controlled conditions involving perfect statistical stability. In this talk, I will describe ongoing work in my lab that is building on this foundation to understand how the brain makes decisions under more dynamic conditions. First, I will describe a more general theoretical framework describing optimal decision-making in dynamic environments, which includes traditional accumulate-to-bound models as a special case but more generally prescribes adaptive processes to interpret, accumulate, and use evidence to form effective decisions. Second, I will describe behavioral, neural, and physiological (pupil size, a marker of arousal) data showing that the primate brain follows many of these adaptive principles to form decisions. Third, I will describe ongoing work relating these complex, adaptive decision-making dynamics to Occam's Razor, including evidence that human decision-making includes a "simplicity bias" that reflects not just parsimony but also normative principles needed to provide adaptivity to real environmental changes without being oversensitive to noise.*