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## Anterior Cingulate Cortex: Scaffold for the Memories which Guide Adaptive Choices

The anterior cingulate cortex (ACC) is perhaps one of the most well studied yet least understood areas of the cortex. It has been implicated in monitoring for errors, conflict, and reward. Others suggest it plays a key role in economic decision making, assigning value to actions or choice options. Still others have emphasized its role in memory, pain, or volition. Data from my lab show that ACC lesions makes rats aversive to effort exertion and increase perseverative choices, consistent with a decision-making interpretation. We have also recorded from dozens of ACC cells during an effort-reward decision task. The data show that both effort and reward are multiplexed across a subset of ACC cells, supporting a role for ACC in weighing effort and reward. However, the dominant driver of ACC activity is spatial position. Even small changes in an animal's position can modulate the firing of ACC cells. In fact, the firing of roughly 30 ACC cells is sufficient to completely predict the animal's position. Together, the data support the idea that the ACC provides a rich representation of context--where the animal is and what he/she is doing—which can be combined with information about reward and punishment to form memories which guide subsequent actions.