Kim Blackwell, PhD, VMD

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Education

PhD, Bioengineering, University of Pennsylvania | VMD, University of Pennsylvania

Key Interests

Neuroscience | Synaptic Plasticity | Basal Ganglia | Parkinson's Disease | Addiction | Memory | Electrophysiology | Computational Modeling | Calcium Dynamics

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SELECT PUBLICATIONS

- K. T. Blackwell *et al.*, Molecular mechanisms underlying striatal synaptic plasticity: relevance to chronic alcohol consumption and seeking. *Eur J Neurosci.* (2018).
- S. L. Hawes *et al.*, Long-term plasticity of corticostriatal synapses is modulated by pathway-specific co-release of opioids through κ-opioid receptors. *J Physiol.* 595(16), 5637-5652 (2017).
- J. Jędrzejewska-Szmek *et al.*, Calcium dynamics predict direction of synaptic plasticity in striatal spiny projection neurons. *Eur J Neurosci.* 45(8), 1044-1056 (2017).
- S. Damodaran *et al.*, Desynchronization of fast-spiking interneurons reduces β-band oscillations and imbalance in firing in the dopamine-depleted striatum. *J Neurosci.* 35(3), 1149-59 (2016).

Research Focus

The basal ganglia are a collection of brain areas involved in normal learning and motor behavior as well as diseases such as Parkinson's disease, and addiction. Inputs to the basal ganglia represent the environment, with the critical molecule dopamine signaling reward. We are investigating the interaction of dopamine with other inputs to understand how the basal ganglia mediate between goal directed learning and habit learning. We are also interested in how the absence of dopamine produces the symptoms of Parkinson's Disease and how overly strong dopamine leads to addiction.

Current Projects

- Using brain slice electrophysiology to understand the mechanisms underlying sex differences in synaptic plasticity and learning
- Developing computational models of the signaling pathway interactions underlying synaptic plasticity, memory storage, and relapse to drugs of abuse.
- Developing computational models of neuronal electrical activity and calcium dynamics to understand how in vivo like patterns of synaptic input produce synaptic plasticity.
- Development of software tools to facilitate investigation of critical questions in neuroscience.