

**SEMINARS *in***  
**NEUROSCIENCE**

2017-18



**William Catterall**  
**University of Washington**

Host: Emilio Carbone

**Calcium Channel Regulation,  
Synaptic Plasticity, and Spatial Learning**

The voltage-gated calcium channel Cav2.1 triggers fast neurotransmission at most synapses in the brain. This channel forms a large signaling complex in the presynaptic membrane, which includes calmodulin-like calcium sensor proteins. Trains of brief depolarizations induce calcium-dependent facilitation followed by calcium-dependent inactivation. Transfection of Cav2.1 into cultured sympathetic neurons induces facilitation and rapid depression similar to a CNS synapse, and both facilitation and rapid depression depend on regulation of Cav2.1 channels by calcium sensor proteins. Inserting the IM-AA mutation in the calcium sensor protein binding site of Cav2.1 into the mouse genome impairs synaptic plasticity in hippocampal synapses, and these mice have weakened long-term potentiation and severely impaired spatial learning and memory. Evidently, biphasic regulation of Cav2.1 channels by calmodulin-like calcium sensor proteins is crucial for short-term synaptic plasticity and for spatial learning and memory.

**TUESDAY**  
**Wednesday 7, 2018**  
**FROM 2:00 P.M.**

**Room A**  
**C.So Massimo D' Azeglio,52**  
**Torino**