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Ion channels in the axon: their role in short-term dynamics and homeostatic plasticity

Ion channels in the axon play multiple functions from action potential conduction to excitation-secretion coupling. Yet, their role in short-term dynamic of synaptic circuits is poorly understood. In the first part of my talk, we will discuss how voltage-gated sodium channels in the axon discriminate and transmit coincidence detection in L5 pyramidal neurons.

Axonal ion channels are also involved in long-term adaption of intrinsic neuronal excitability in response to chronic activity changes (i.e. homeostatic plasticity). In the second part of my talk, we will discuss how voltage-gated potassium channels contribute to both stabilization of intrinsic excitability and control of glutamate release, thus linking homeostatic synaptic plasticity to homeostatic intrinsic plasticity.