

Spine depolarization without dendritic depolarization

Re-interpretation bases on the IPL mechanism

It was found that in excitatory synapses, large spine depolarization recruit voltage-dependent channels without dendritic depolarization, due to high spine neck resistance (Beaulieu-Laroche and Harnett, 2018). Hence, it leads to the following questions. "What is the functional importance of seemingly isolated spine depolarization?" and "Since this is a conserved property, how to provide a mechanistic explanation in terms of brain functions?" Another finding from the same laboratory is that distal human dendrites provide limited excitation to the soma even in the presence of dendritic spikes (Beaulieu-Laroche et al., 2018). The observation that even dendritic spikes have only a limited role in neuronal firing is of huge significance. This again reinforces the need for figuring out the functions achieved by depolarization of spine heads in excitatory cortical neurons. The IPL mechanism can explain how depolarization of spines is associated with generation of units of internal sensations independent of neuronal firing. These experimental findings compel us to undertake dedicated experimental verification of the IPL mechanism.

References

Beaulieu-Laroche L and Harnett MT. 2018. Dendritic spines prevent synaptic voltage clamp. *Neuron* 97(1): 75–82.e3. [PubMed](#)

Beaulieu-Laroche L, Toloza EHS, van der Goes MS, Lafourcade M, Barnagian D, Williams ZM, Eskandar EN, Frosch MP, Cash SS, Harnett MT. 2018. Enhanced dendritic compartmentalization in human cortical neurons. *Cell* 175(3): 643–651.e14. [PubMed](#)