## Deciphering cortical codes for movement by intracellular stimulation Brecht M Dept Neuroscience, Erasmus MC, Rotterdam

The relationship between AP discharge patterns of individual cortical neurons and motor behavior is a core interest of neurobiology. Extracellular stimulation techniques and extracellular single cell recordings have demonstrated that the activity of neurons in the primary motor cortex is closely associated with movement generation in mammals, but both techniques are not suited to pinpoint the motor commands issued by individual cells. This problem was overcome by applying intracellular stimulation to identified neurons in the deep layers of whisker motor cortex of lightly anesthetized rats. We find that that AP initiation in individual cortical cells causes whisker movements. Intracellular stimulation in layer 5 evokes movements that are phase locked from trial to trial, whereas APs injected in L6 cells evoke bursts of whisking without specifying the phase of the individual movement. Pyramidal cell and interneuron stimulation evoked movements of opposite directions confirming a functional antagonism of these cell types. AP number had only little effect on whisker movement amplitude but it strongly affected movement dynamics and an inverse relationship was found for AP frequency. The brain's capacity to translate APs injected into individual cortical neurons into noticeable motor outputs suggests that cortical APs are processed with the utmost precision.

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