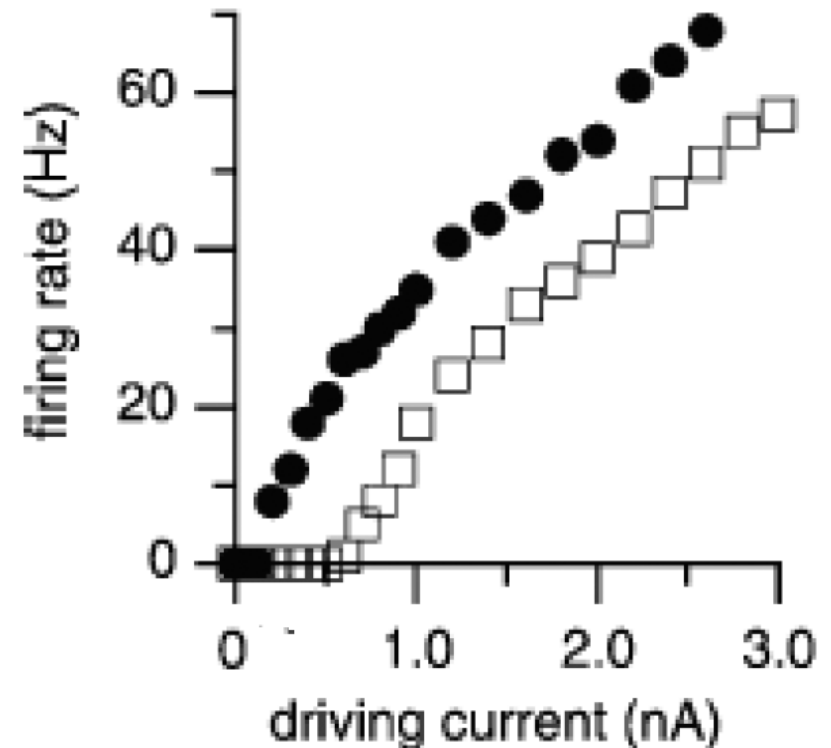


We exploit the shift in the gain (f - I) curve with changes in membrane conductance

Effects of Shunting on Response Gain

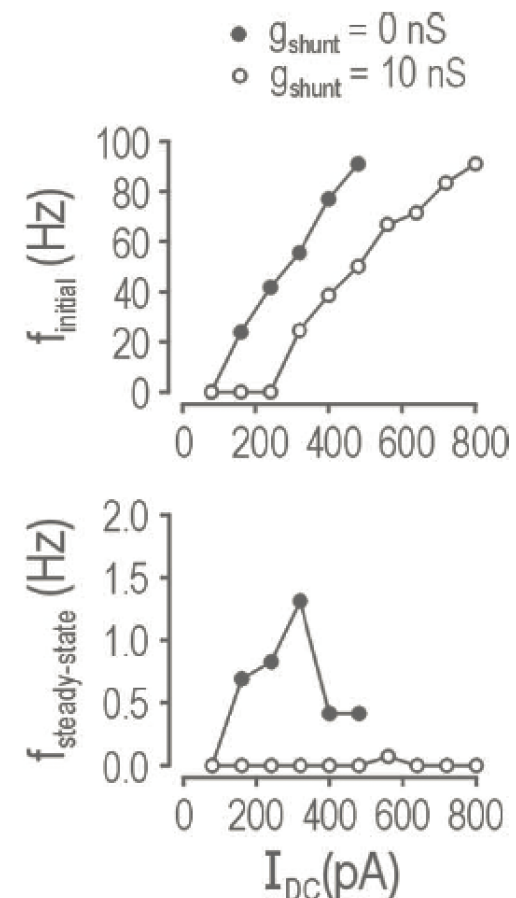
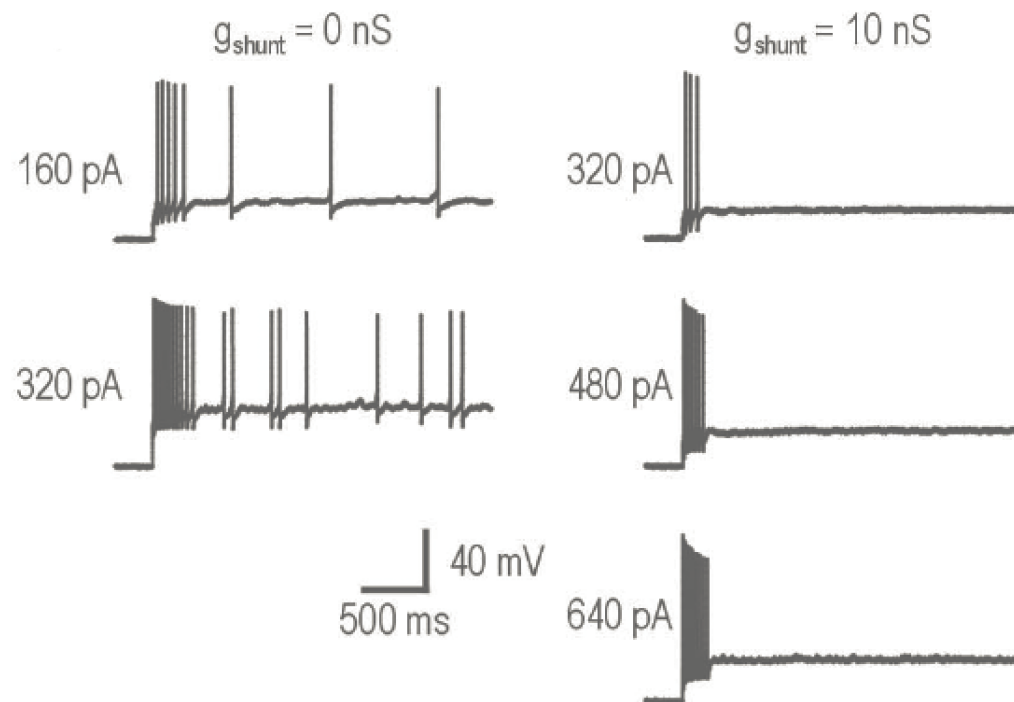
Firing rate versus constant driving current for a neuron without (closed circles), and with (open squares) 32 nS of additional constant conductance. The result is a pure shift of the firing-rate curve.



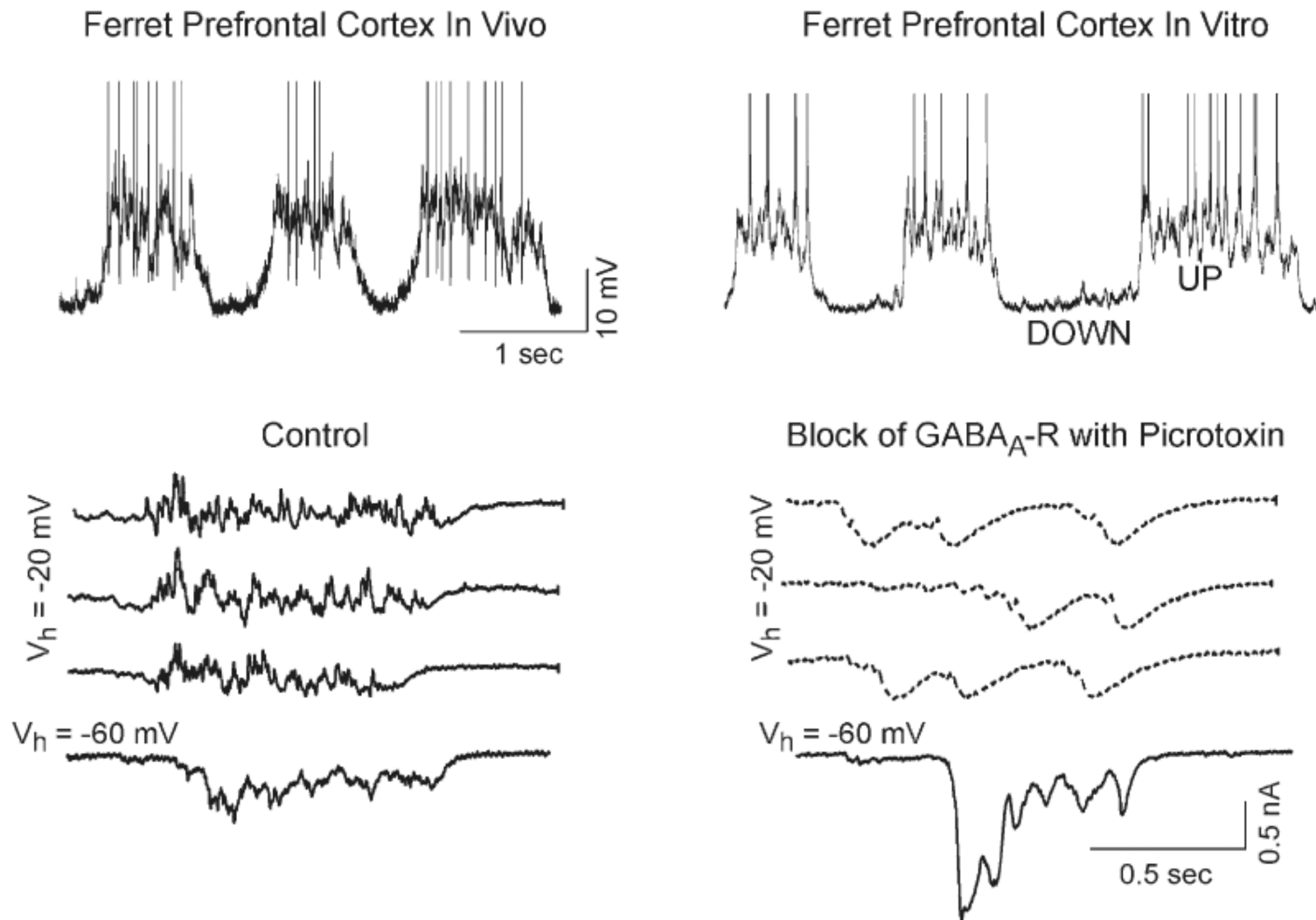
Chance, Abbott and Reyes (Neuron, 2002)

Nonlinear Interaction between Shunting and Adaptation Controls a Switch between Integration and Coincidence Detection in Pyramidal Neurons

Steven A. Prescott,¹ Stéphanie Ratté,² Yves De Koninck,³ and Terrence J. Sejnowski^{1,4}

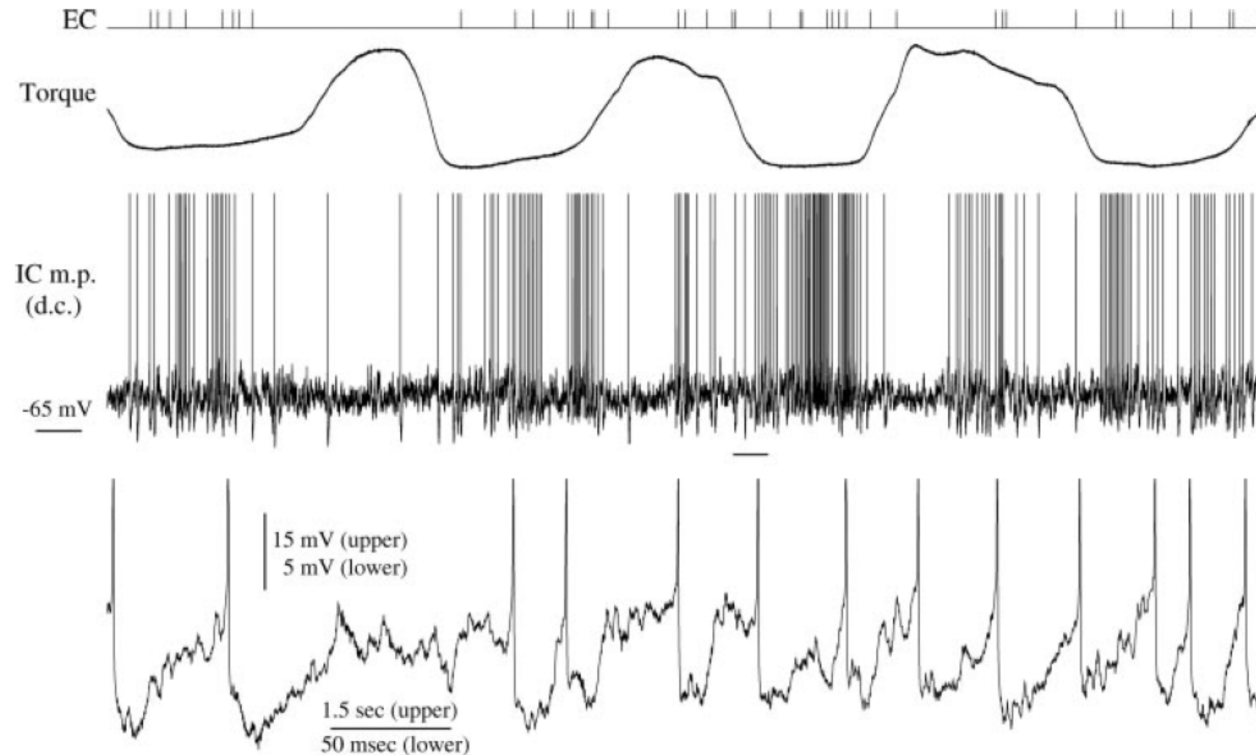


Intracellular records illustrate synaptic summation (anesthetized ferret)



Hasenstaub, Shu, Haider, Kraushaar, Duque & McCormick (Neuron 2005)

Intracellular records illustrate synaptic summation (behaving monkey)



Simultaneous 2-electrode recordings of spikes from an extracellular unit (EC, shown as acceptance pulses from window discriminator), torque, and intracellular (IC) membrane potential from another neuron.

Bottom trace: expanded version of the marked section in the *top IC trace*. IC cell was recorded at a cortical depth of $1,760\ \mu\text{m}$ and EC at $1,600\ \mu\text{m}$ in the precentral dimple area of the right hemisphere while monkey performed the motor task. *Top IC trace* was clipped at $-20\ \text{mV}$ and the *bottom trace* at $-55\ \text{mV}$.

Chen and Fetz (J Neurophysiology 2005)

Rate equation:

$$r_i(t) = f\left\{\sum_{j=1}^N W_{ij}r_j(t) + W^{in}r_i^{in}(t) - \theta\right\}.$$

Synaptic inputs:

$$W_{ij} \equiv G_{ij}\tau_{ij}(E_j - E_L - v_c)$$

is the synaptic efficiency, or connection strength, between neurons in the network.

External input:

$$W^{in} \equiv G_{in}\tau_{in}(E_{in} - E_L - v_c)$$

is the synaptic efficiency, or strength, for an external input to the neuron.

Threshold:

$$\theta \equiv I_c^o + g_L^o v_c.$$