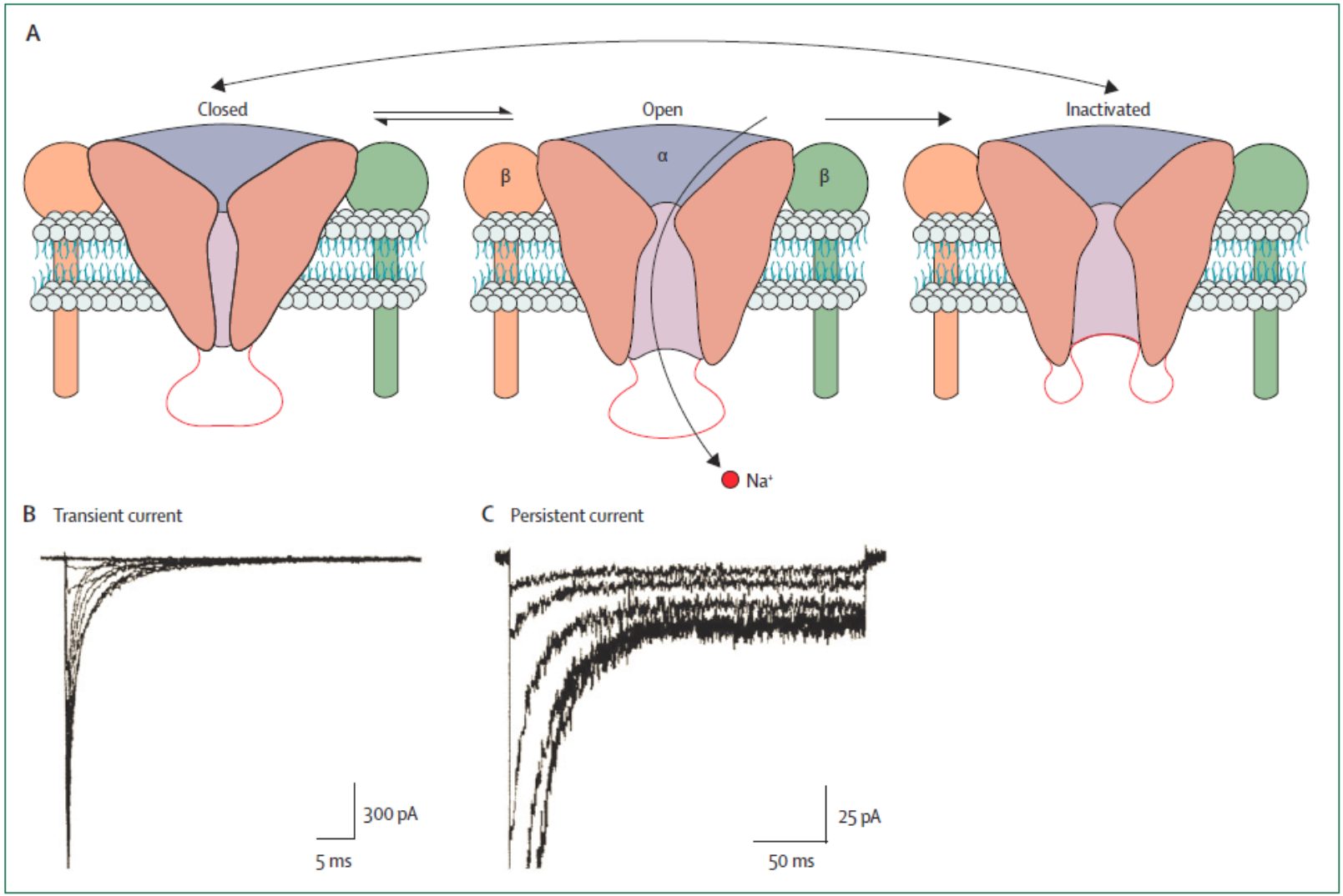
Lezione sull'Eccitabilita' Neuronale

Massimo Avoli

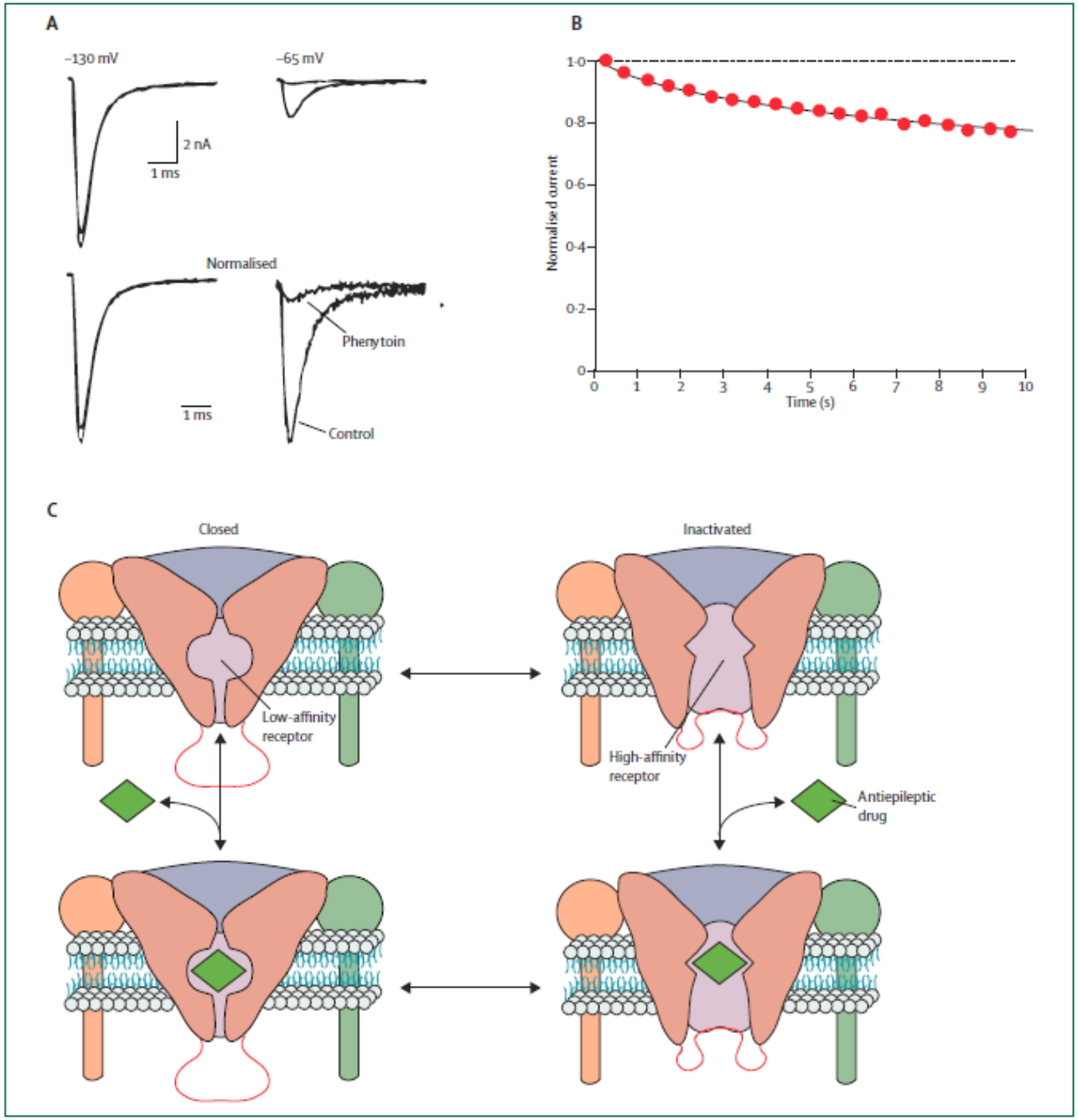
14 novembre 2014

Intrinsic currents

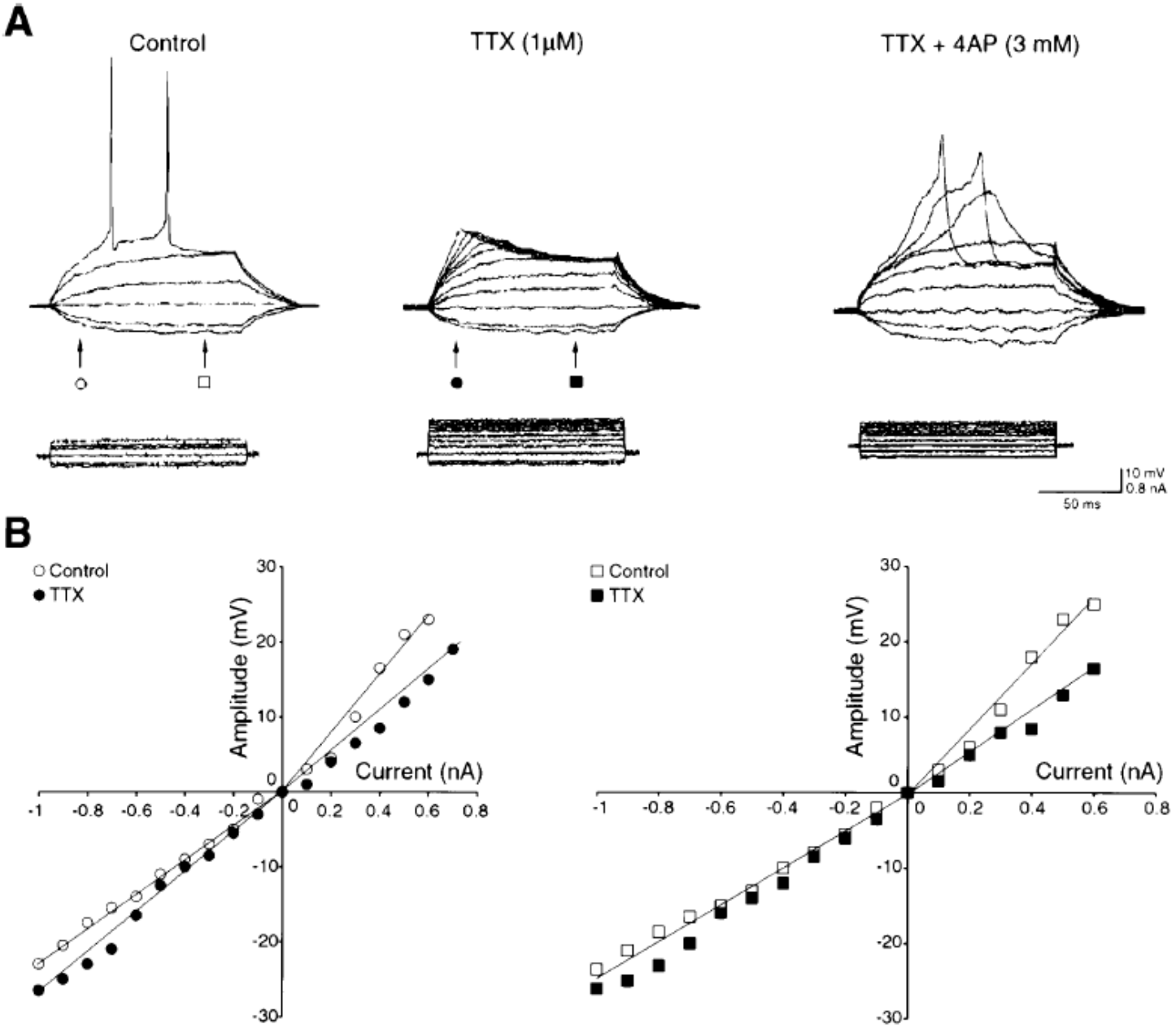
Voltage-gated sodium currents



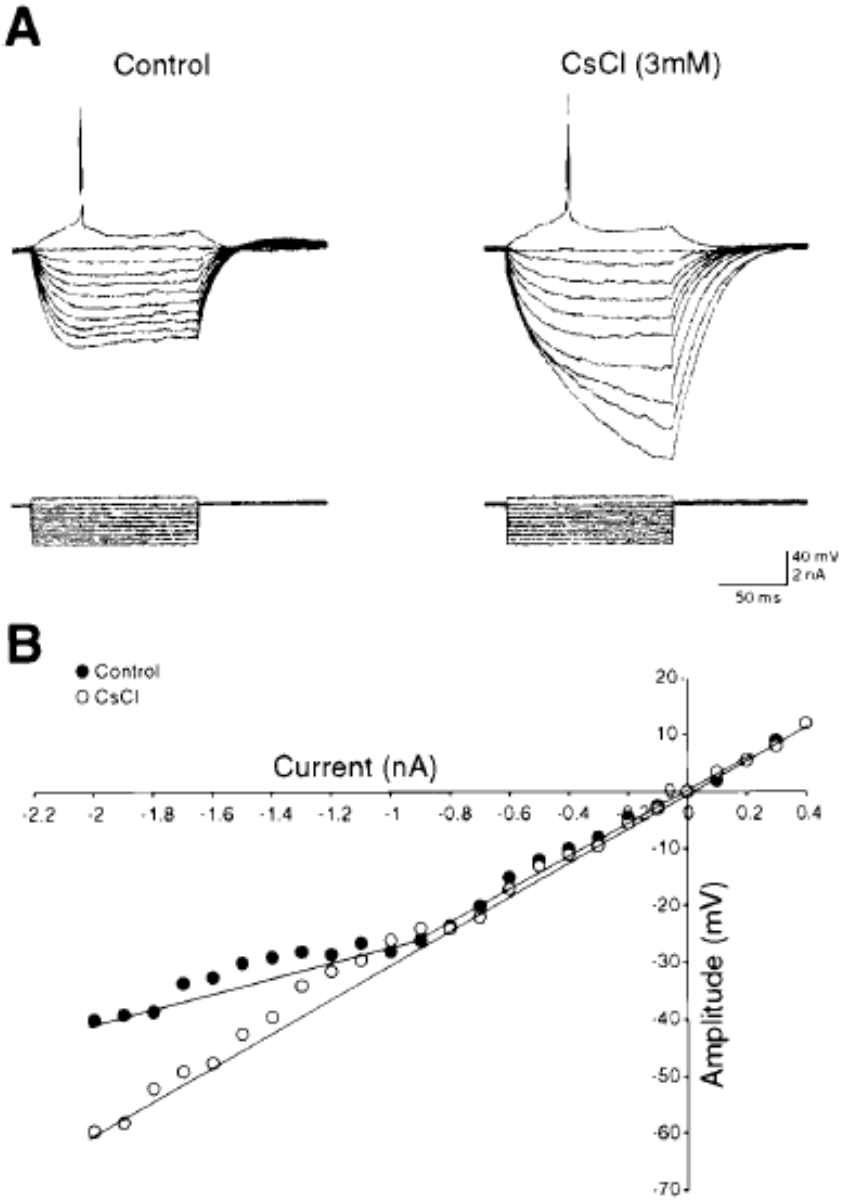
Voltage-gated sodium currents and AEDs



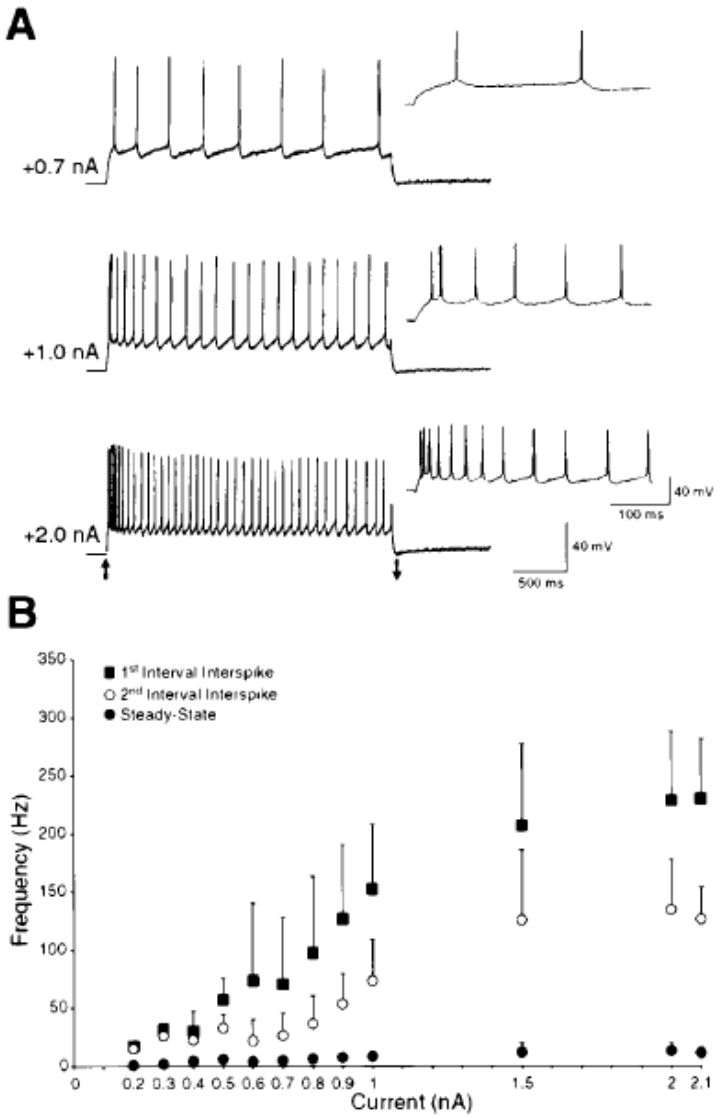
Voltage-gated currents make the non-ohmic behavior

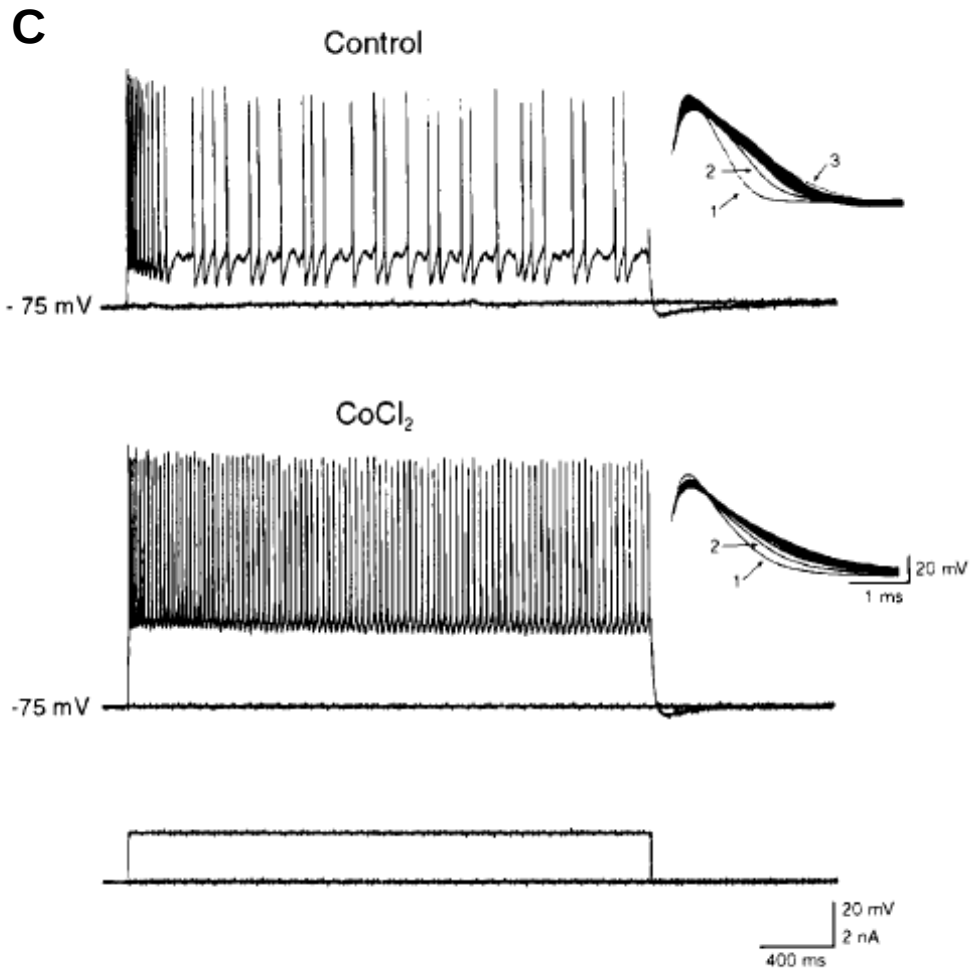


The Ih voltage-gated current



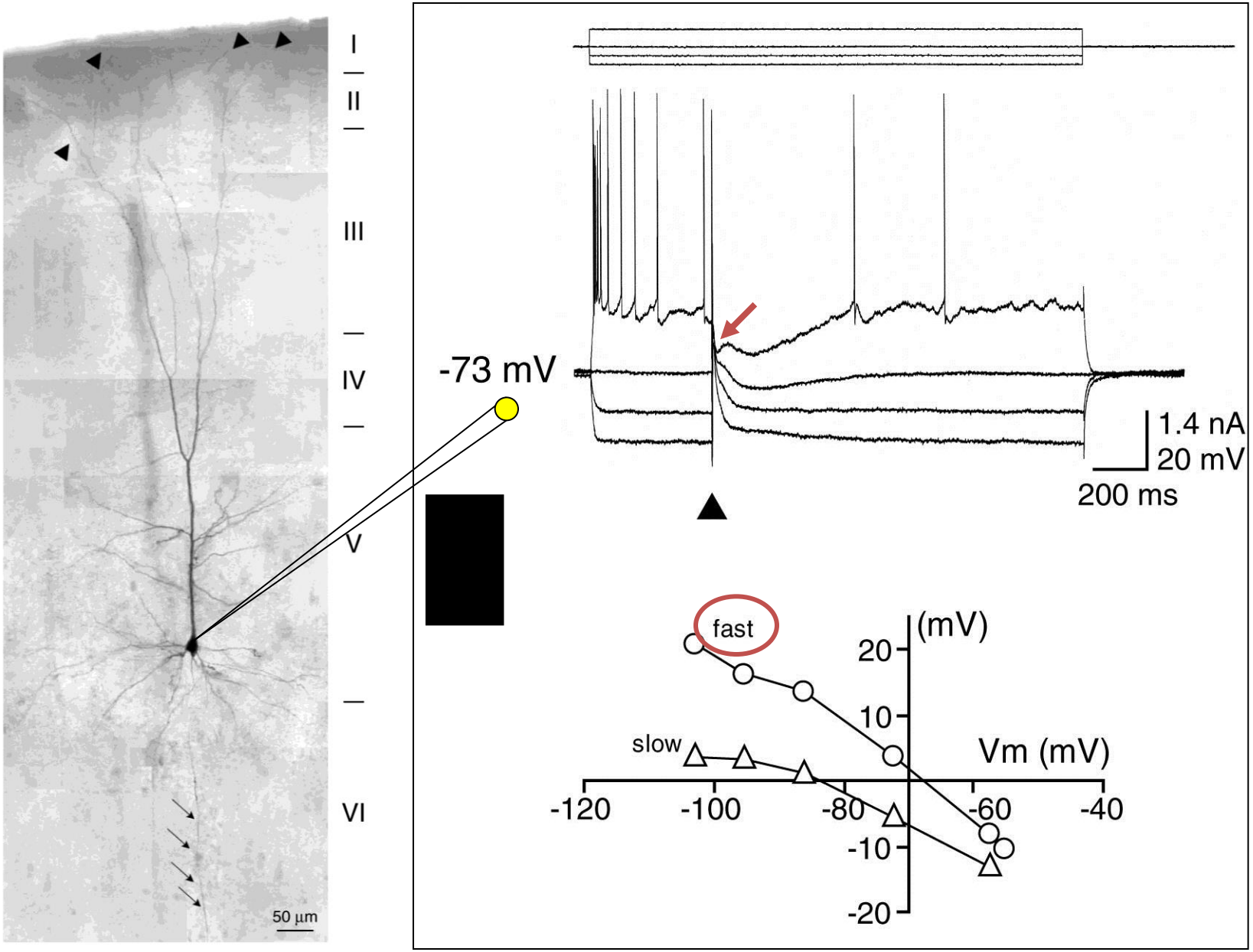
Repetitive firing and AHPs



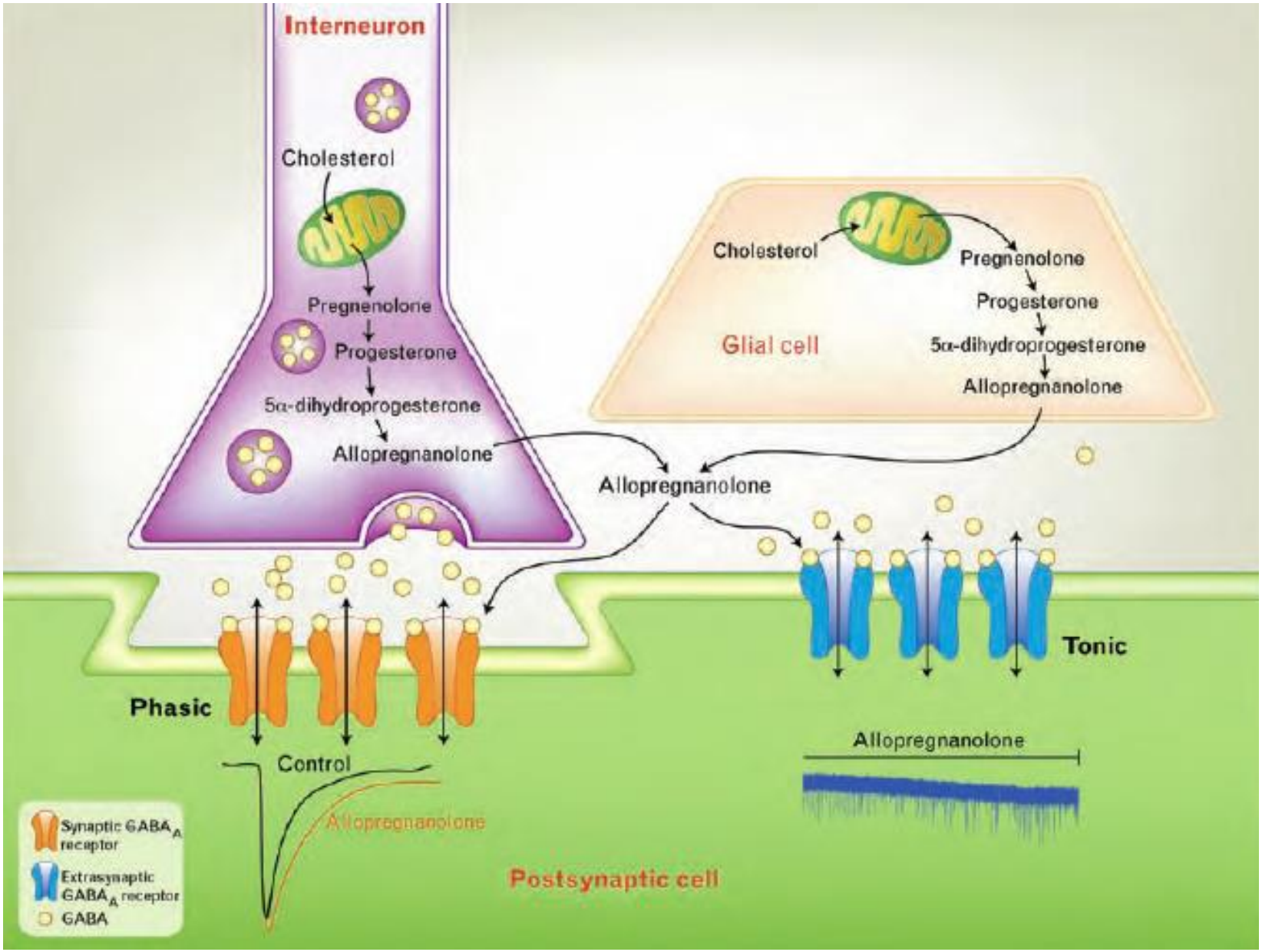


$GABA_A$ receptor signaling

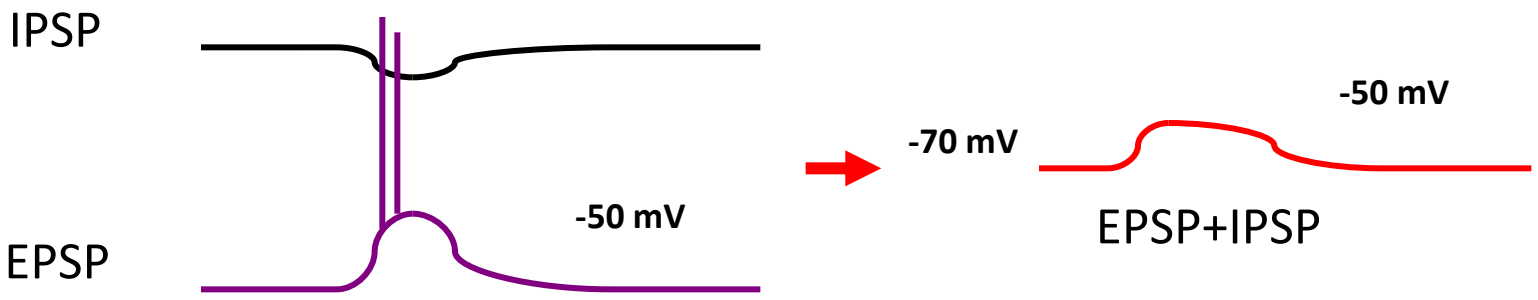
GABA AS AN INHIBITORY TRANSMITTER (a)



GABA AS AN INHIBITORY TRANSMITTER (b)



GABA AS AN INHIBITORY TRANSMITTER (c)



Inhibition = hyperpolarizing "clamp" + shunting action

Shunting action

$V = I \bullet R$

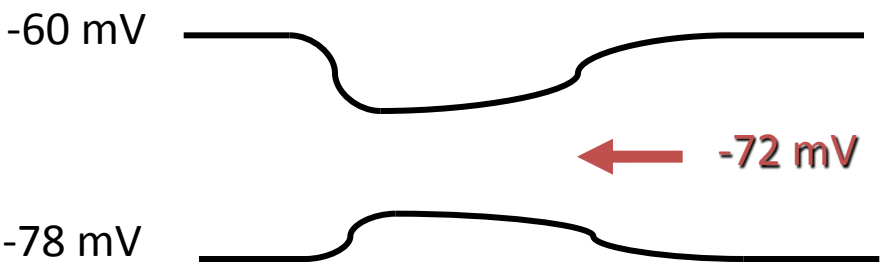
$V = I \bullet R$

$V = I \bullet R$

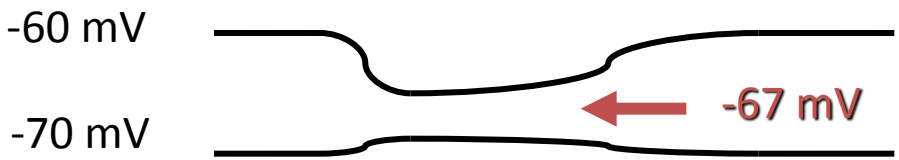
GABAa Cl^- increased conductance

GABA AS AN INHIBITORY TRANSMITTER (d)

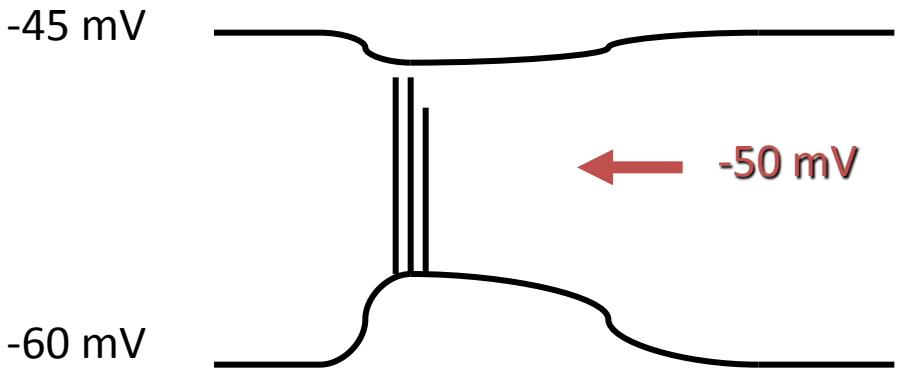
$[Cl]_i < [Cl]_o$



$[Cl]_i < [Cl]_o$

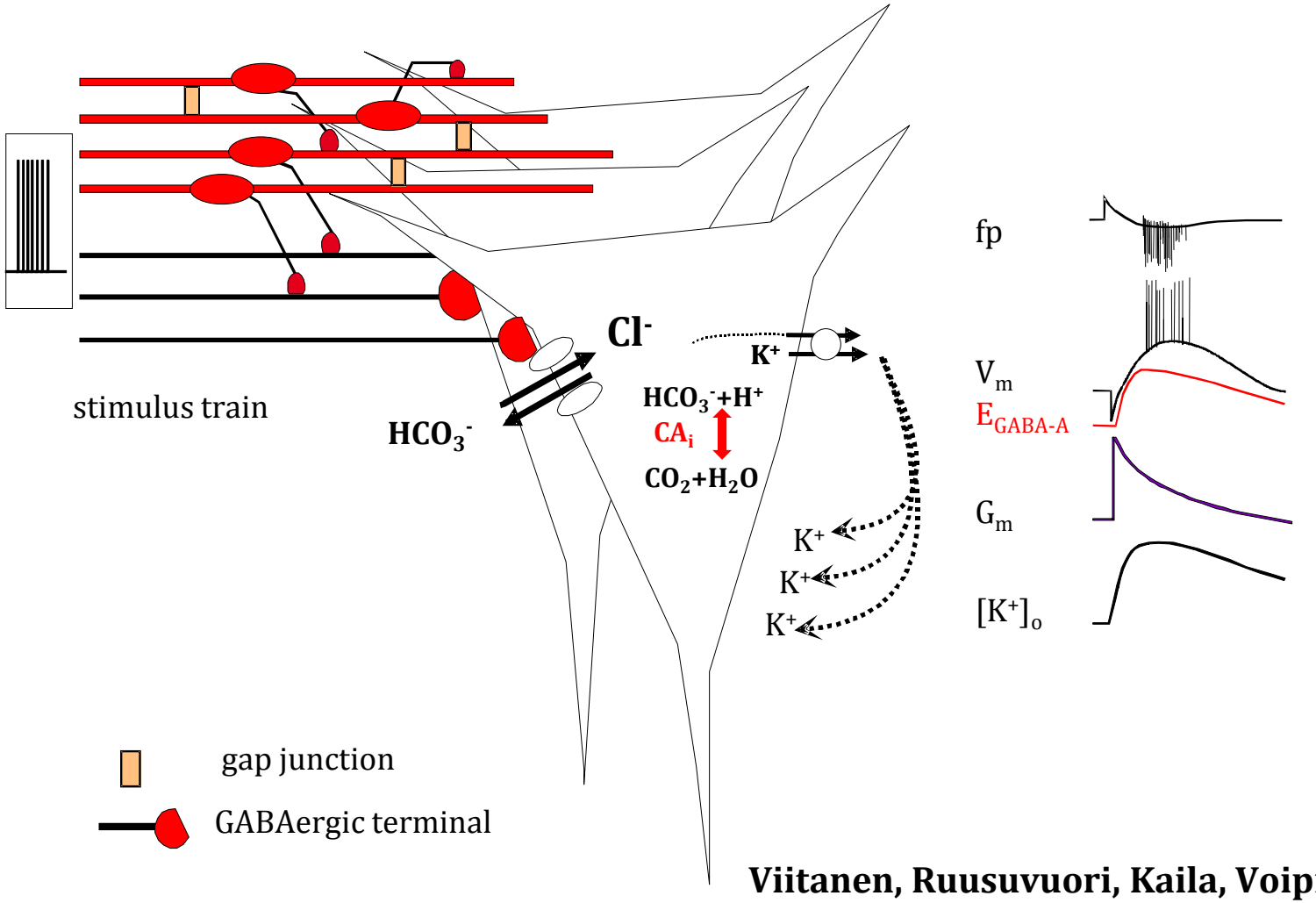


$[Cl]_i \uparrow$ or $[Cl]_o \downarrow$



GABA AS AN INHIBITORY TRANSMITTER (e)

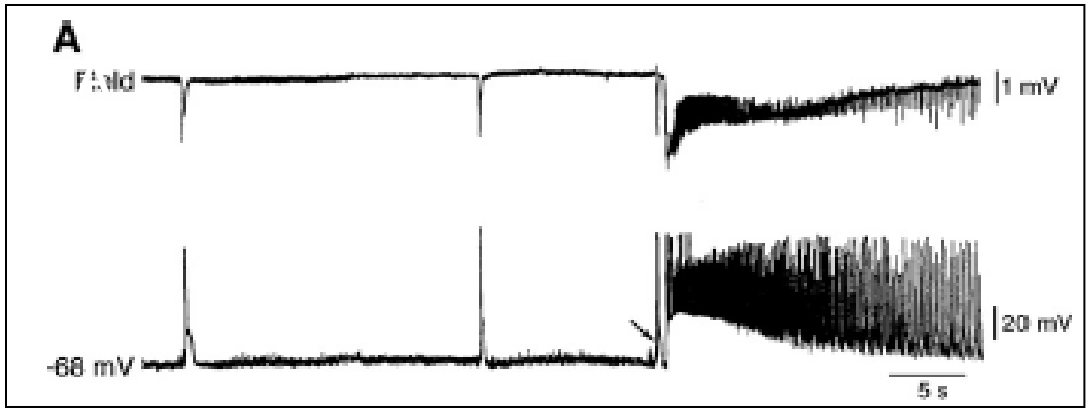
Chloride homestasis and extracellular potassium

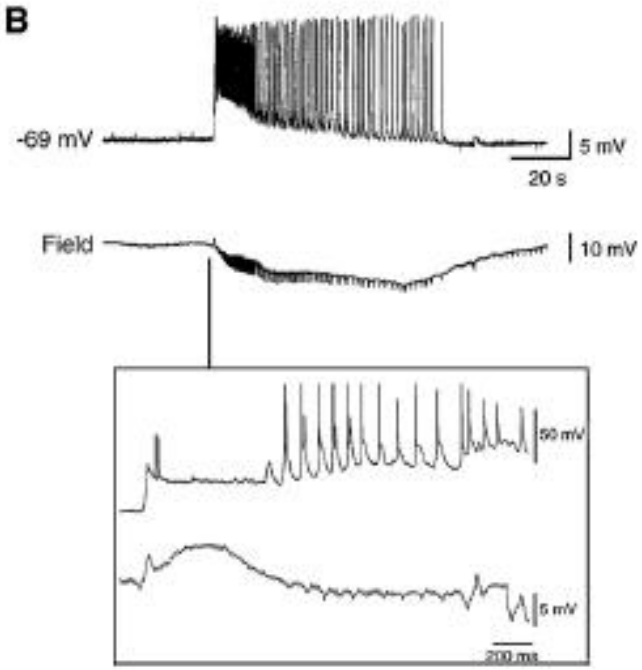


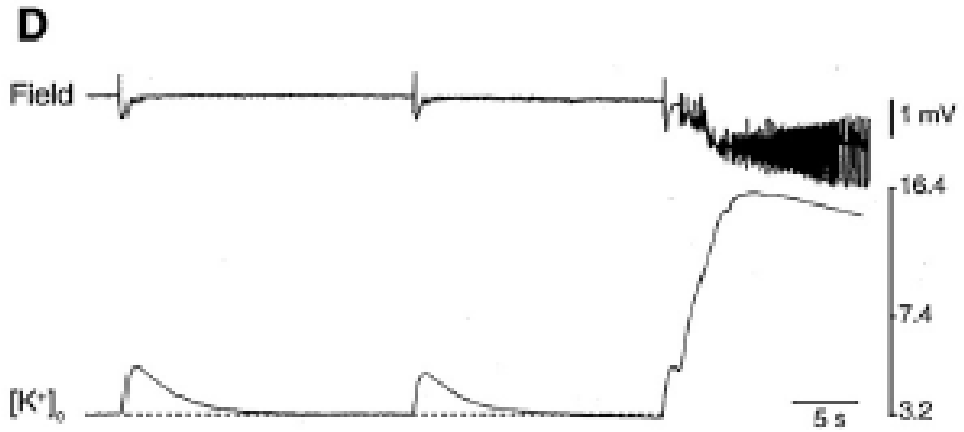
Viitanen, Ruusuvuori, Kaila, Voipio, 2010

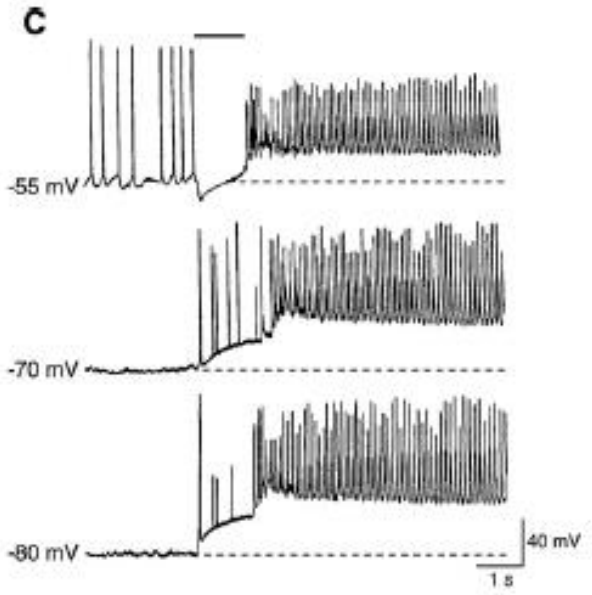
GABA AS AN INHIBITORY TRANSMITTER (f)

GABA mediated increases in extracellular potassium as ictogenic determinants



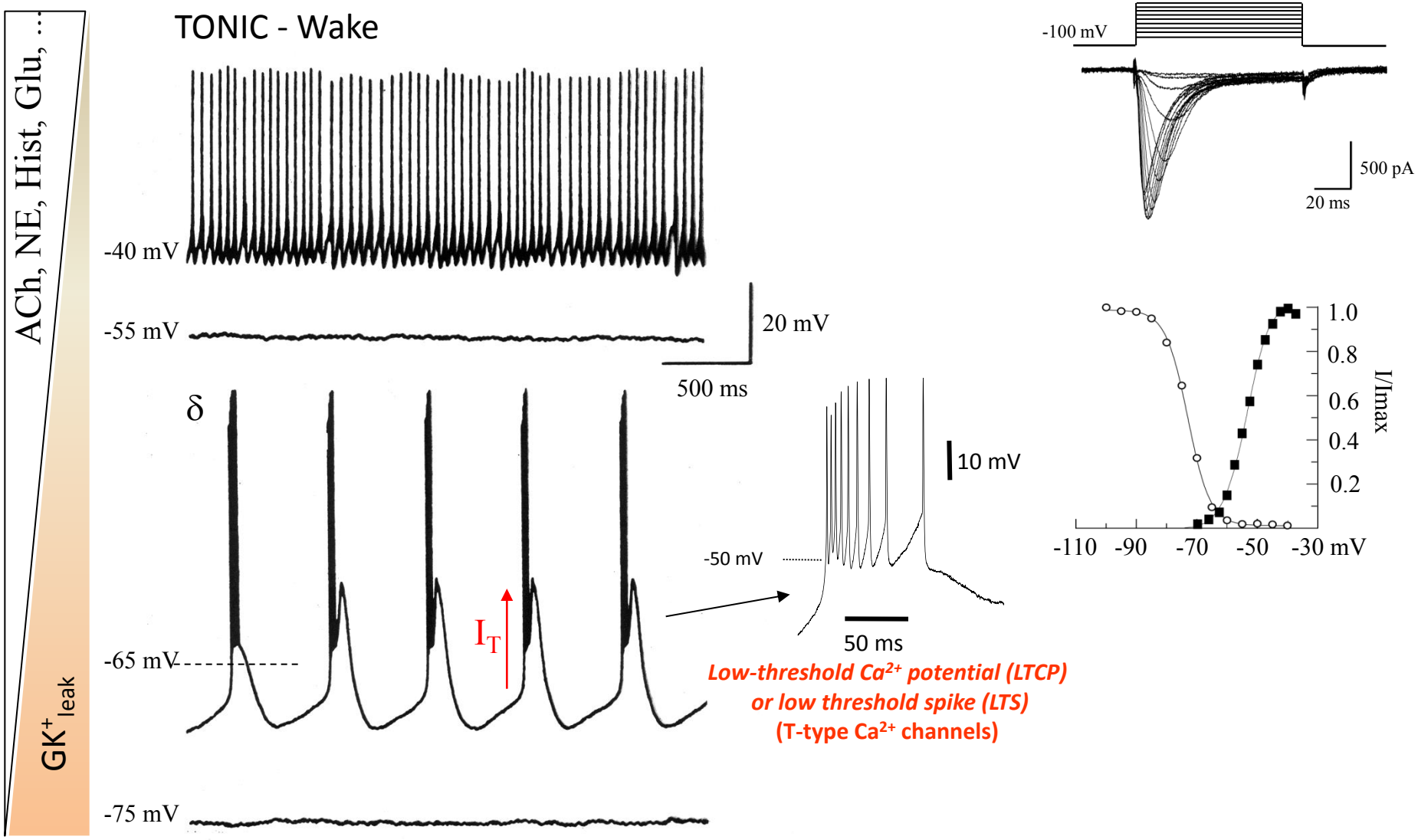






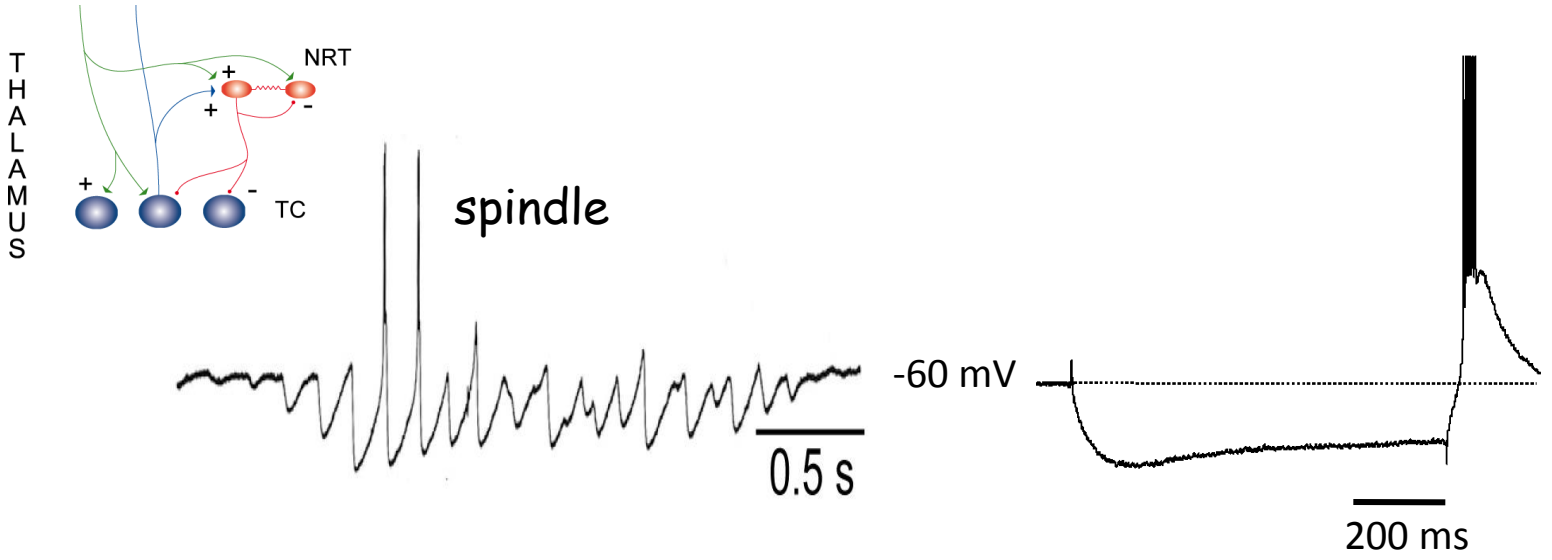
Brain oscillations

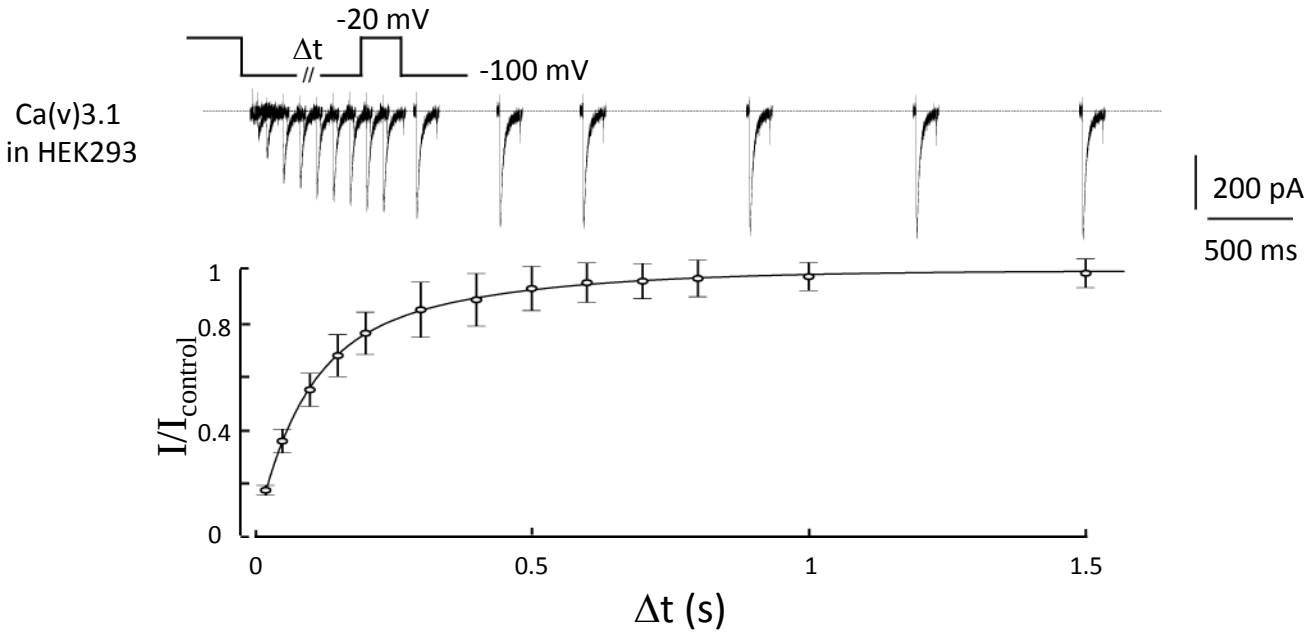
‘Classical’ cellular physiology of thalamocortical (TC) neurons



Low-threshold Ca^{2+} potential (LTCP)
or low threshold spike (LTS)
(T-type Ca^{2+} channels)

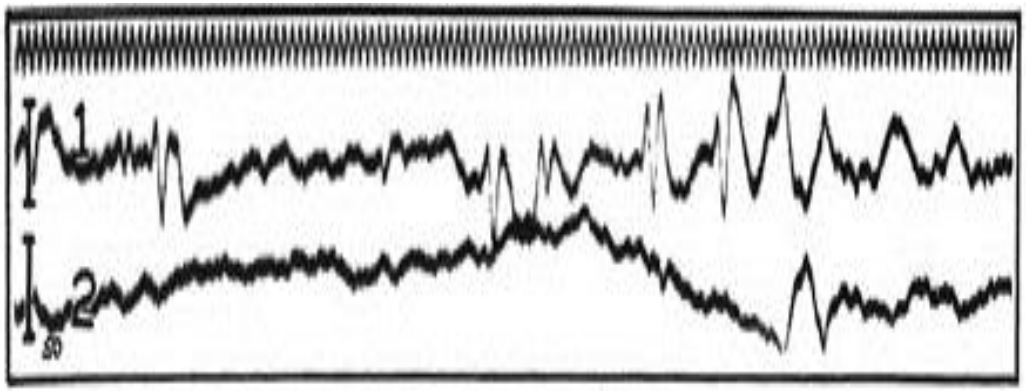
‘Classical’ cellular physiology of thalamocortical (TC) neurons



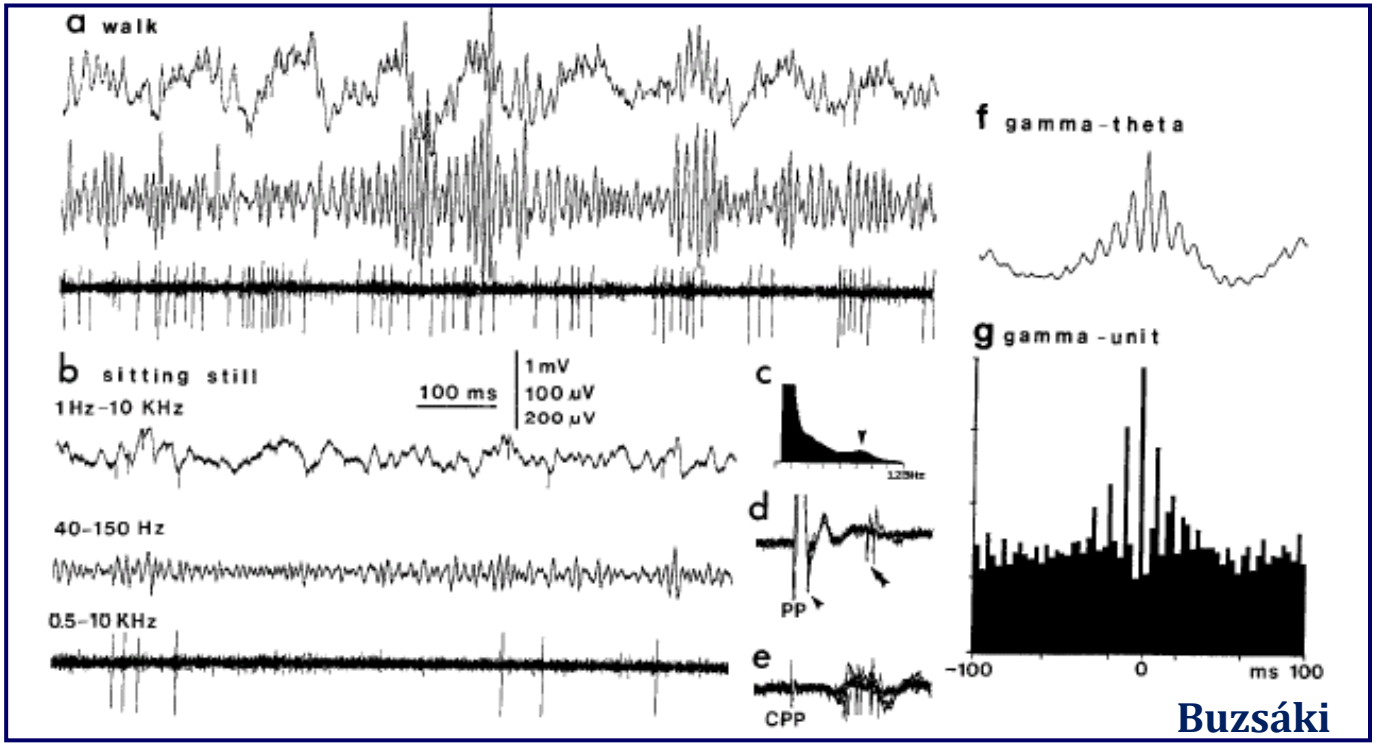


BB

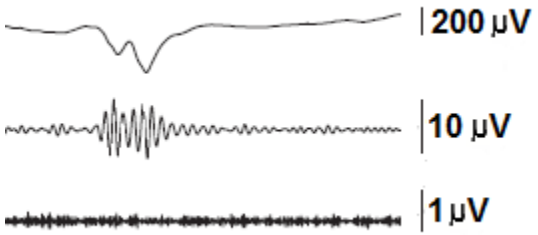

H.H. Jasper,



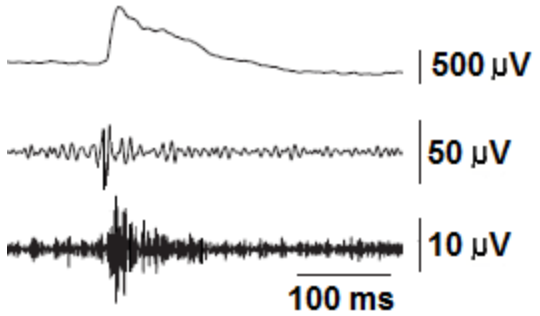
AB

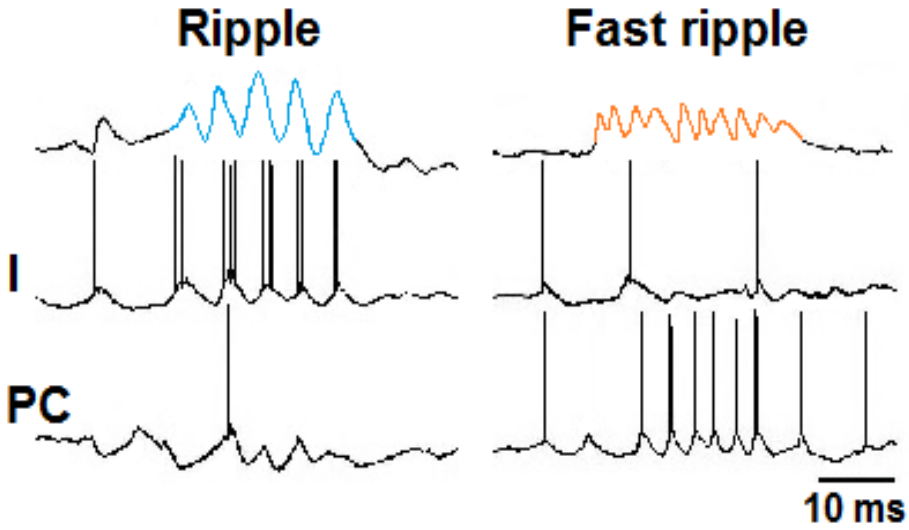

a walk
b sitting still
1Hz-10 KHz
100 ms
1mV
100 µV
200 µV
40-150 Hz
0.5-10 KHz
c
d
PP
e
CPP
f gamma-theta
g gamma-unit
-100
0
ms 100
Buzsáki

HFO between 80-200 Hz (Ripples)



HFO between 250-500 Hz (Fast ripples)





Bragin, Buzsáki, de Curtis, Engle, Gotman, Jacobs , Jefferys, Kahane, Le Van Quen, Lopes da Silva, Menendez de la Prida, Navarro, Staba, Staley, Timofeev, Traub, Wendling, ……. (1990s to now)

Relevant references

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