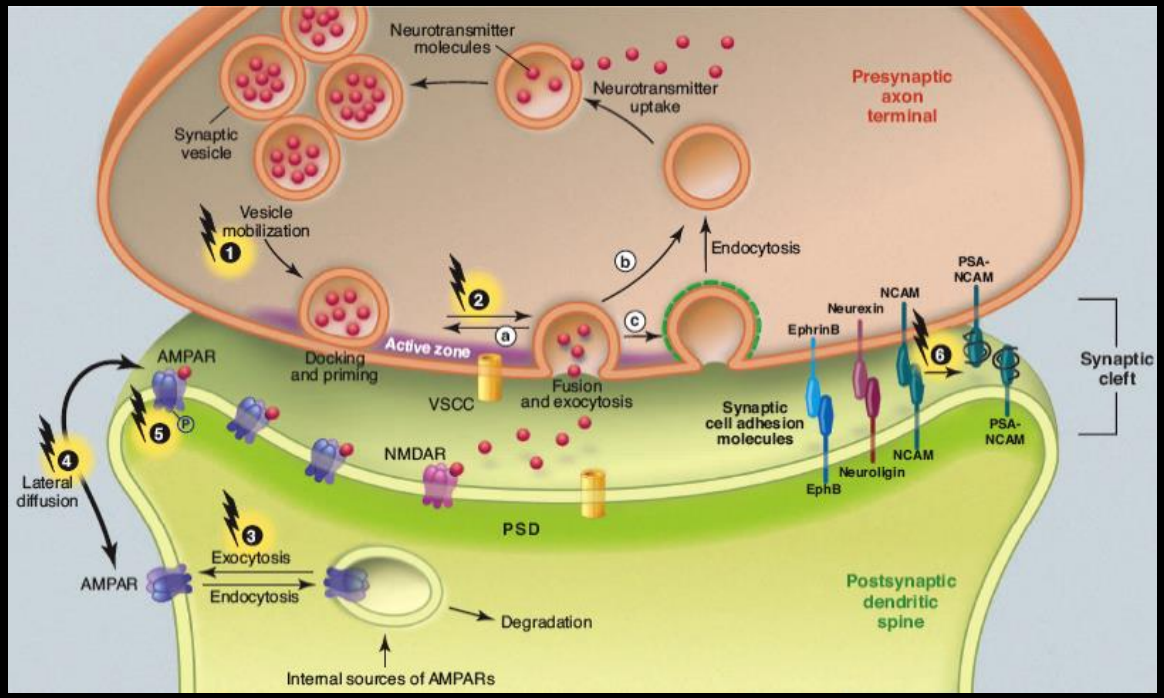
J. Physiol. (1973), **232**, *pp.* 331–356
With 12 *text-figures*
Printed in Great Britain

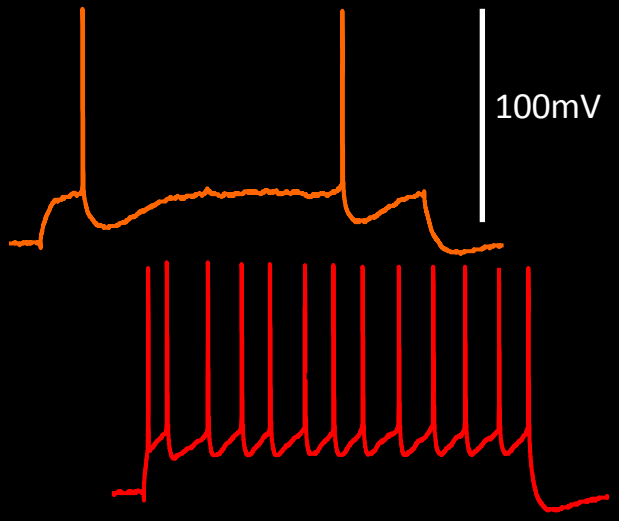
LONG-LASTING POTENTIATION OF SYNAPTIC TRANSMISSION IN THE DENTATE AREA OF THE ANAESTHETIZED RABBIT FOLLOWING STIMULATION OF THE PERFORANT PATH

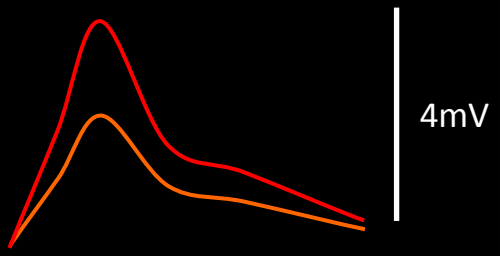
By T. V. P. BLISS and T. LØMO

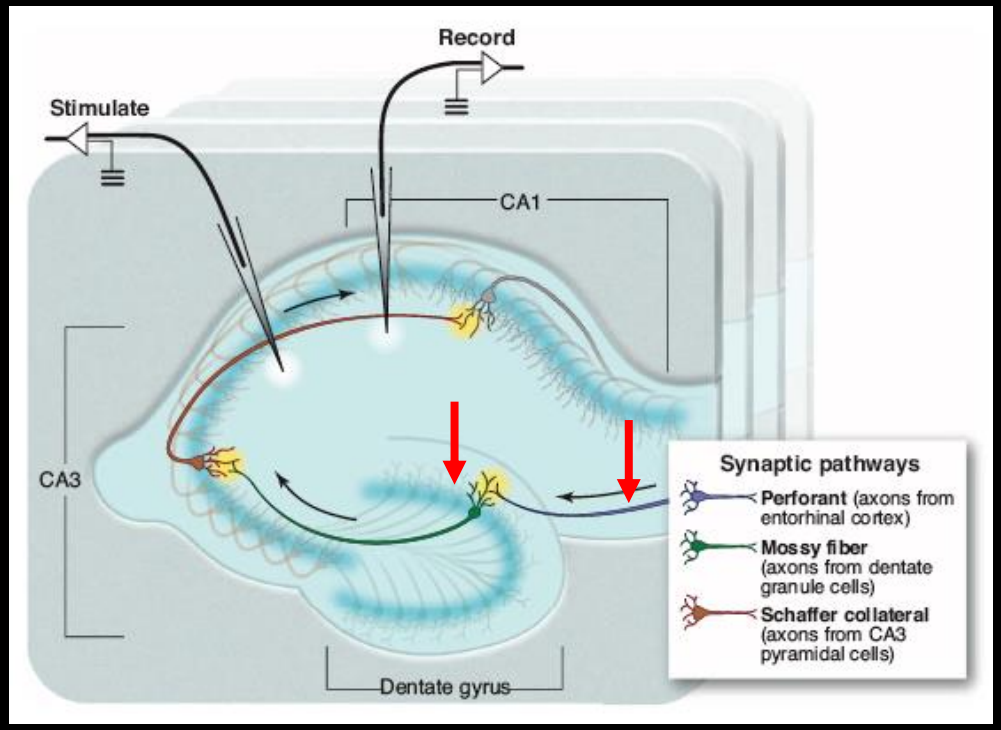
From the National Institute for Medical Research, Mill Hill, London NW7 1AA and the Institute of Neurophysiology, University of Oslo, Norway

(*Received 12 February 1973*)

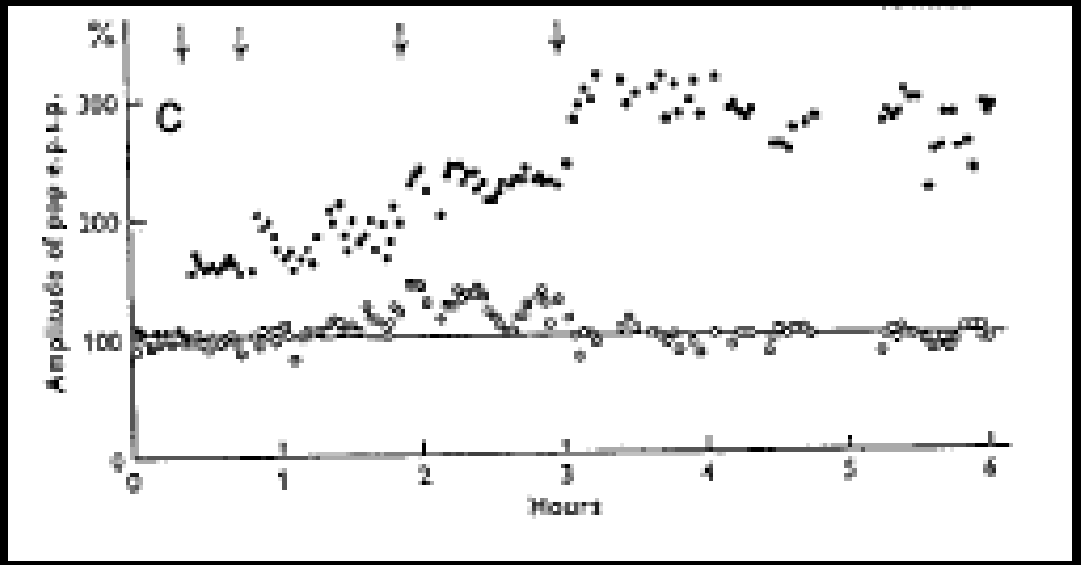

Neurotransmitter molecules
Neurotransmitter uptake
Presynaptic axon terminal
Synaptic vesicle
Vesicle mobilization
Endocytosis
PSA-NCAM
NCAM
Neurexin
EphrinB
Active zone
Docking and priming
Fusion and exocytosis
VSCC
AMPAR
Synaptic cleft
Synaptic cell adhesion molecules
NMDAR
Lateral diffusion
Neuroligin
EphB
PSD
Exocytosis
Endocytosis
AMPAR
Degradation
Postsynaptic dendritic spine
Internal sources of AMPARs

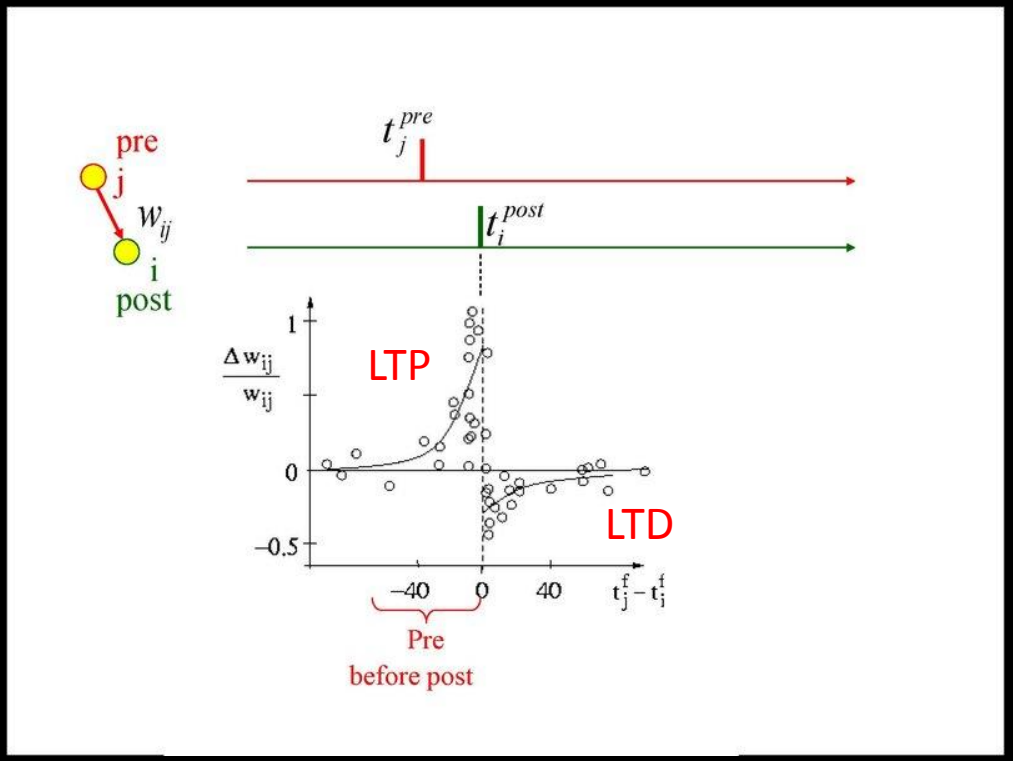

100mV


4mV


Record
Stimulate
CA1
CA3
Dentate gyrus
Synaptic pathways
Perforant (axons from entorhinal cortex)
Mossy fiber (axons from dentate granule cells)
Schaffer collateral (axons from CA3 pyramidal cells)

LTP


%
300
200
100
0
C
1
2
3
4
5
6
Hours



STDP

1997

Sjöström and Gerstner (2010)

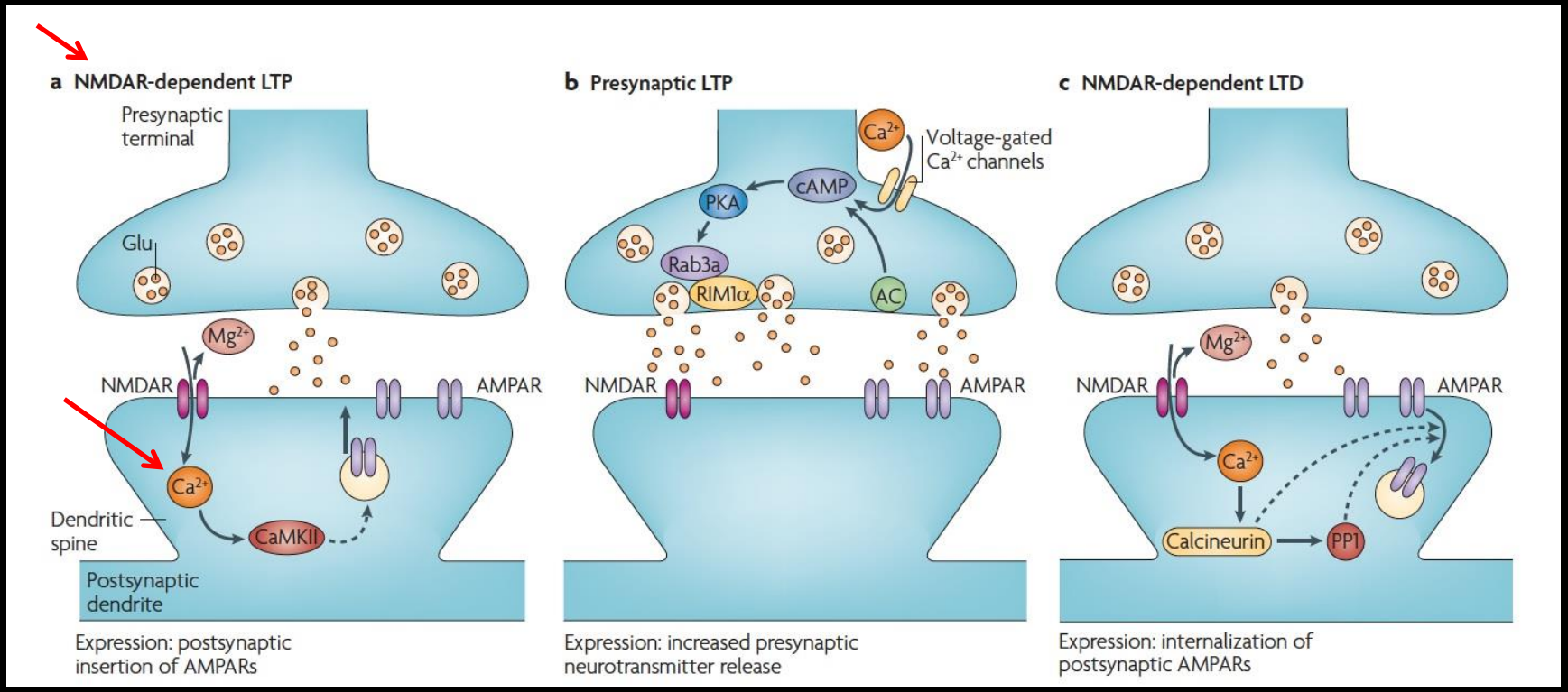
Regulation of Synaptic Efficacy by Coincidence of Postsynaptic APs and EPSPs

Henry Markram,* Joachim Lübke, Michael Frotscher, Bert Sakmann

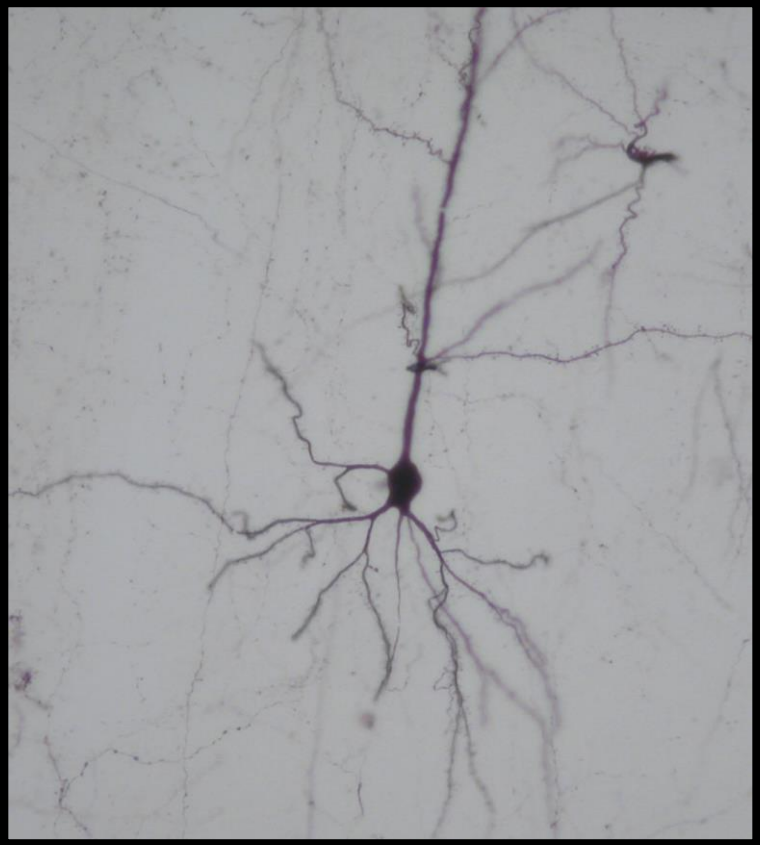
Activity-driven modifications in synaptic connections between neurons in the neocortex may occur during development and learning. In dual whole-cell voltage recordings from pyramidal neurons, the coincidence of postsynaptic action potentials (APs) and unitary excitatory postsynaptic potentials (EPSPs) was found to induce changes in EPSPs. Their average amplitudes were differentially up- or down-regulated, depending on the precise timing of postsynaptic APs relative to EPSPs. These observations suggest that APs propagating back into dendrites serve to modify single active synaptic connections, depending on the pattern of electrical activity in the pre- and postsynaptic neurons.

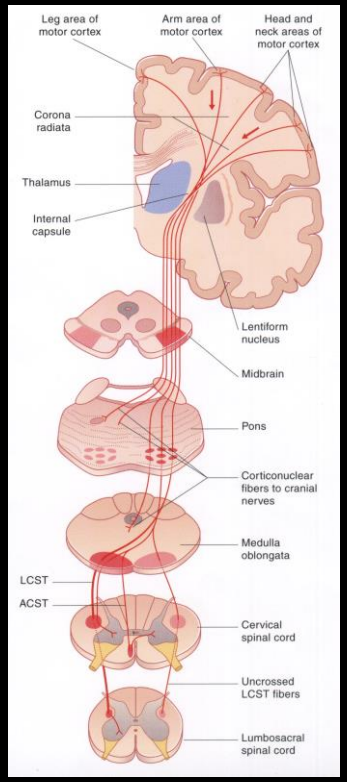
Donald Hebb, 1949

La connessione tra due neuroni è rinforzata se i due neuroni sono attivi simultaneamente
(fire together, wire together)



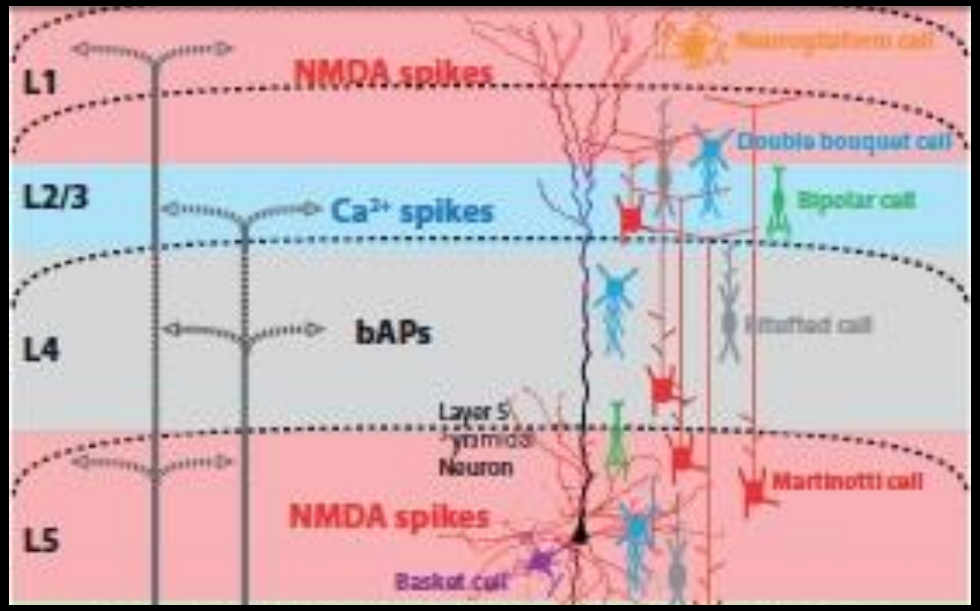
Kauer and Malenka, 2007



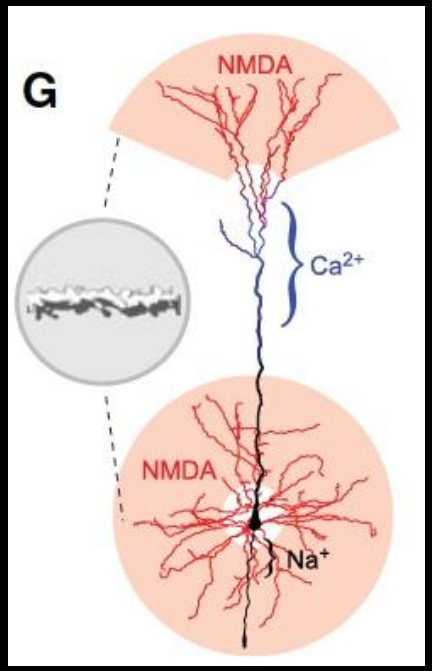

Leg area of motor cortex
Arm area of motor cortex
Head and neck areas of motor cortex
Corona radiata
Thalamus
Internal capsule
Lentiform nucleus
Midbrain
Pons
Corticonuclear fibers to cranial nerves
Medulla oblongata
LCST
ACST
Cervical spinal cord
Uncrossed LCST fibers
Lumbosacral spinal cord

“Enigma supremo”

D. Hubel

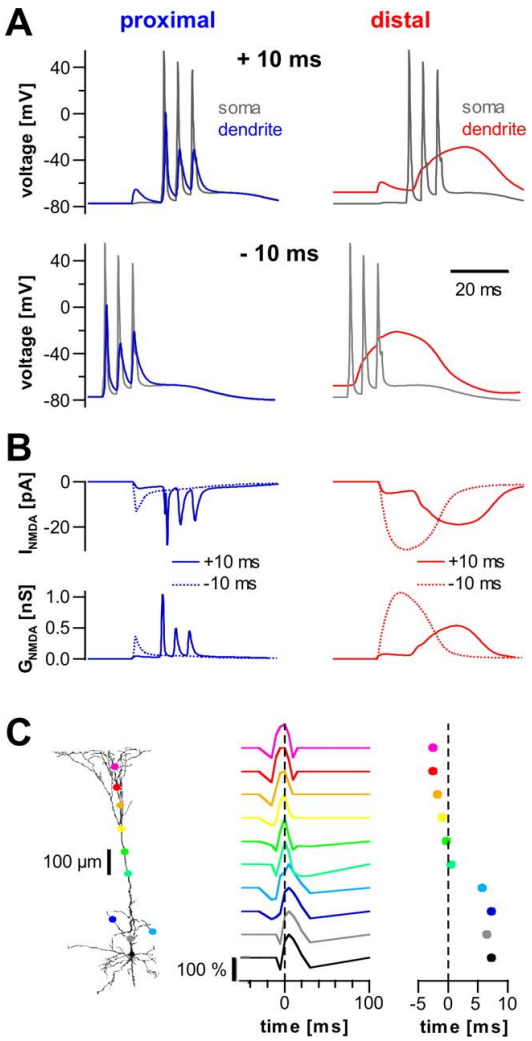


Palmer et al., 2012

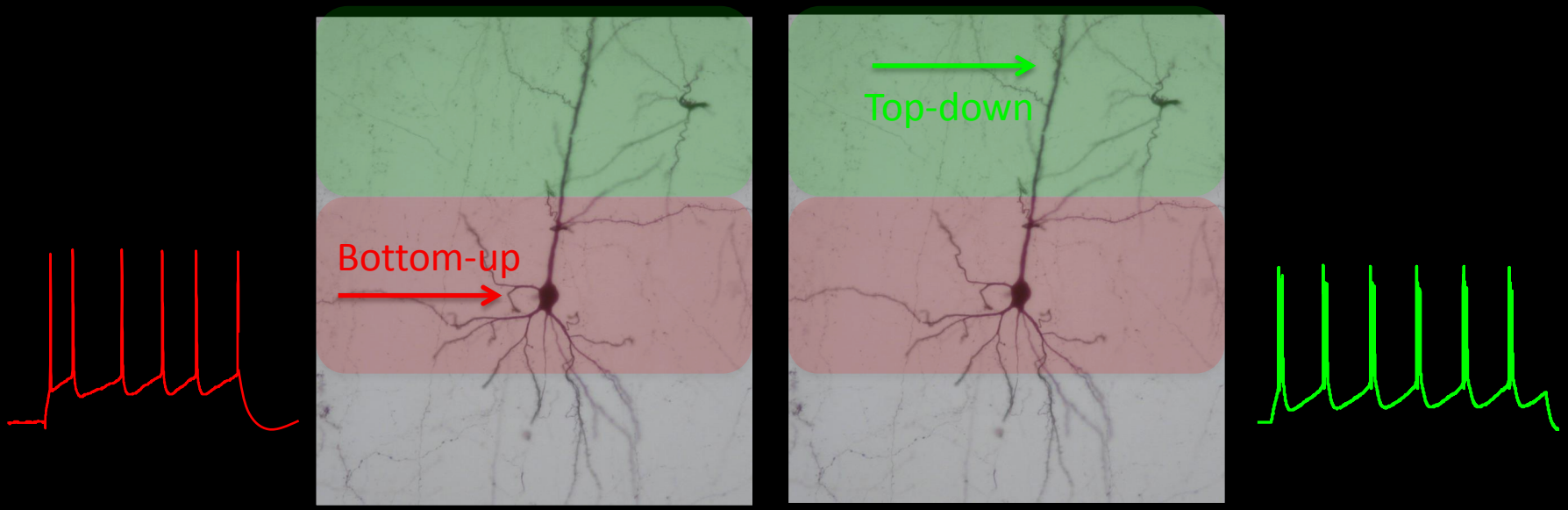


Larkum et al., 2009

Model of STDP induction in apical dendrites of layer 5 pyramidal neurons.



Johannes J. Letzkus et al. J. Neurosci. 2006;26:10420-10429



Contents lists available at ScienceDirect

Brain and Cognition

journal homepage: www.elsevier.com/locate/b&c

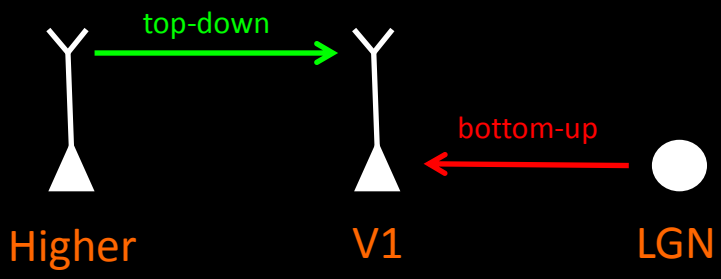
Cognitive functions of intracellular mechanisms for contextual amplification

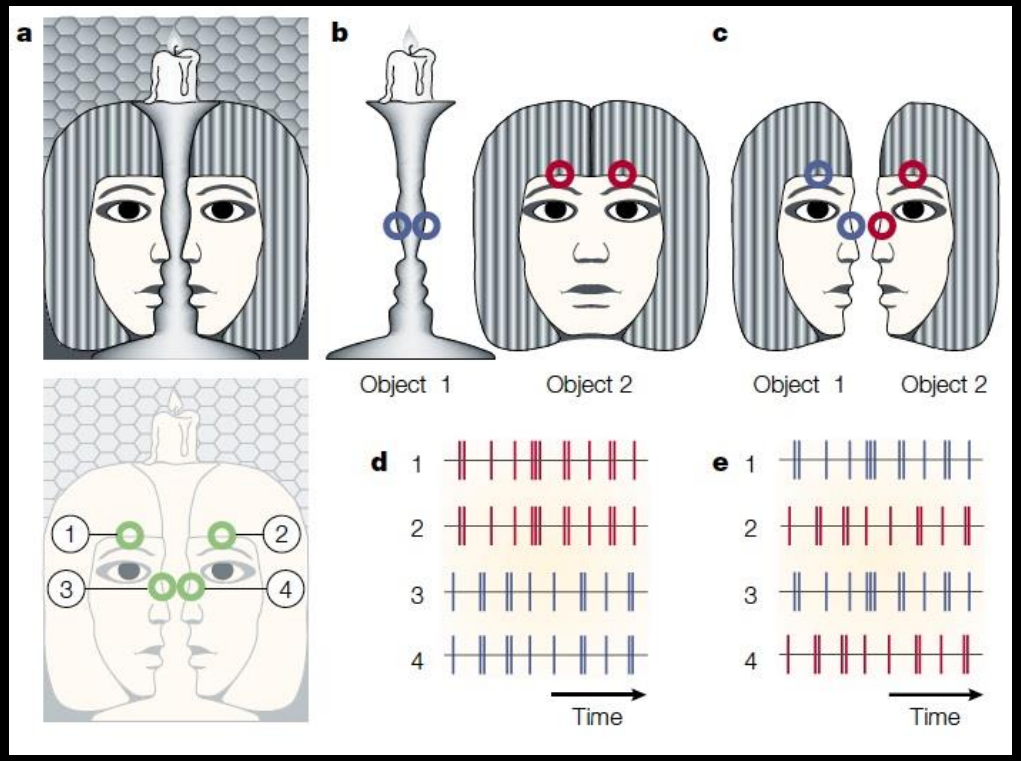
William A. Phillips

School of Natural Sciences, University of Stirling, Stirling FK9 4LA, UK

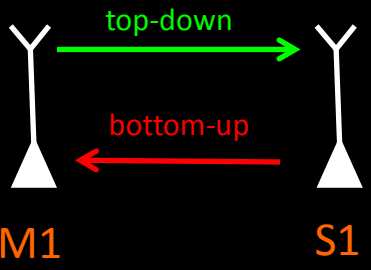
Contextual Amplification

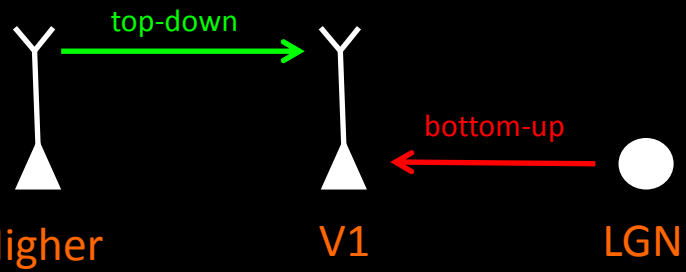
Apical Amplification

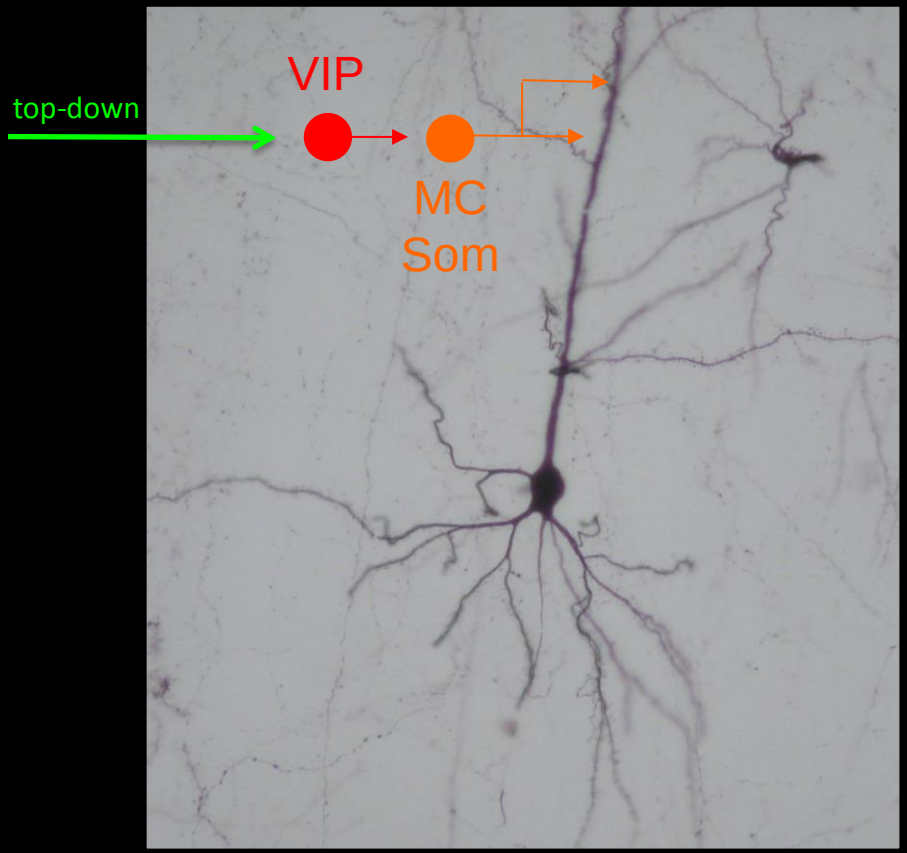


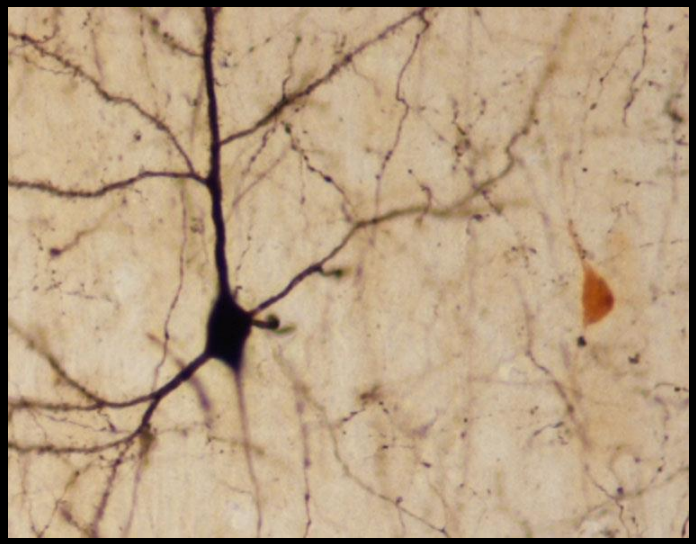


Engel et al., 2001




top-down
bottom-up
Higher
V1
LGN


top-down
VIP
MC
Som

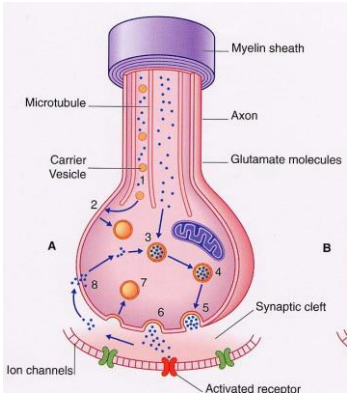


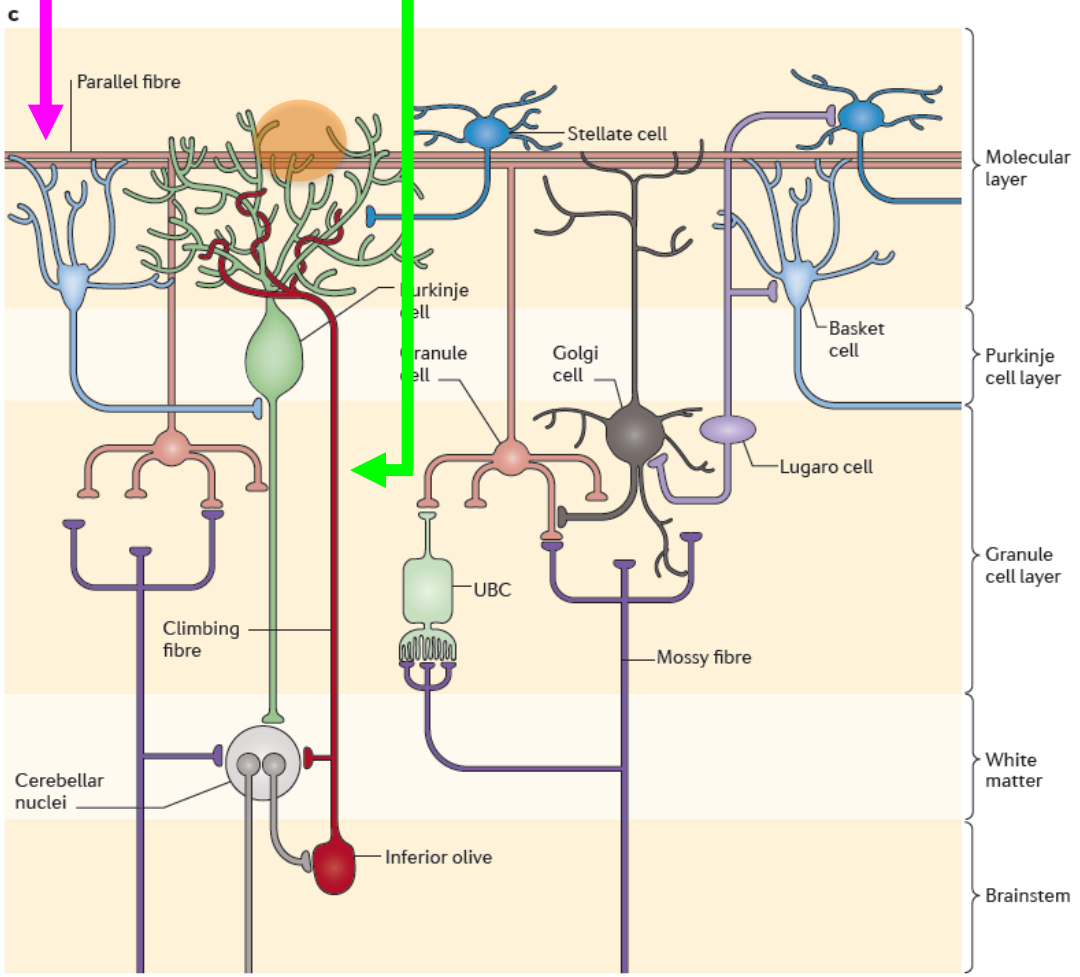
Marr-Albus-Ito

Error

Context

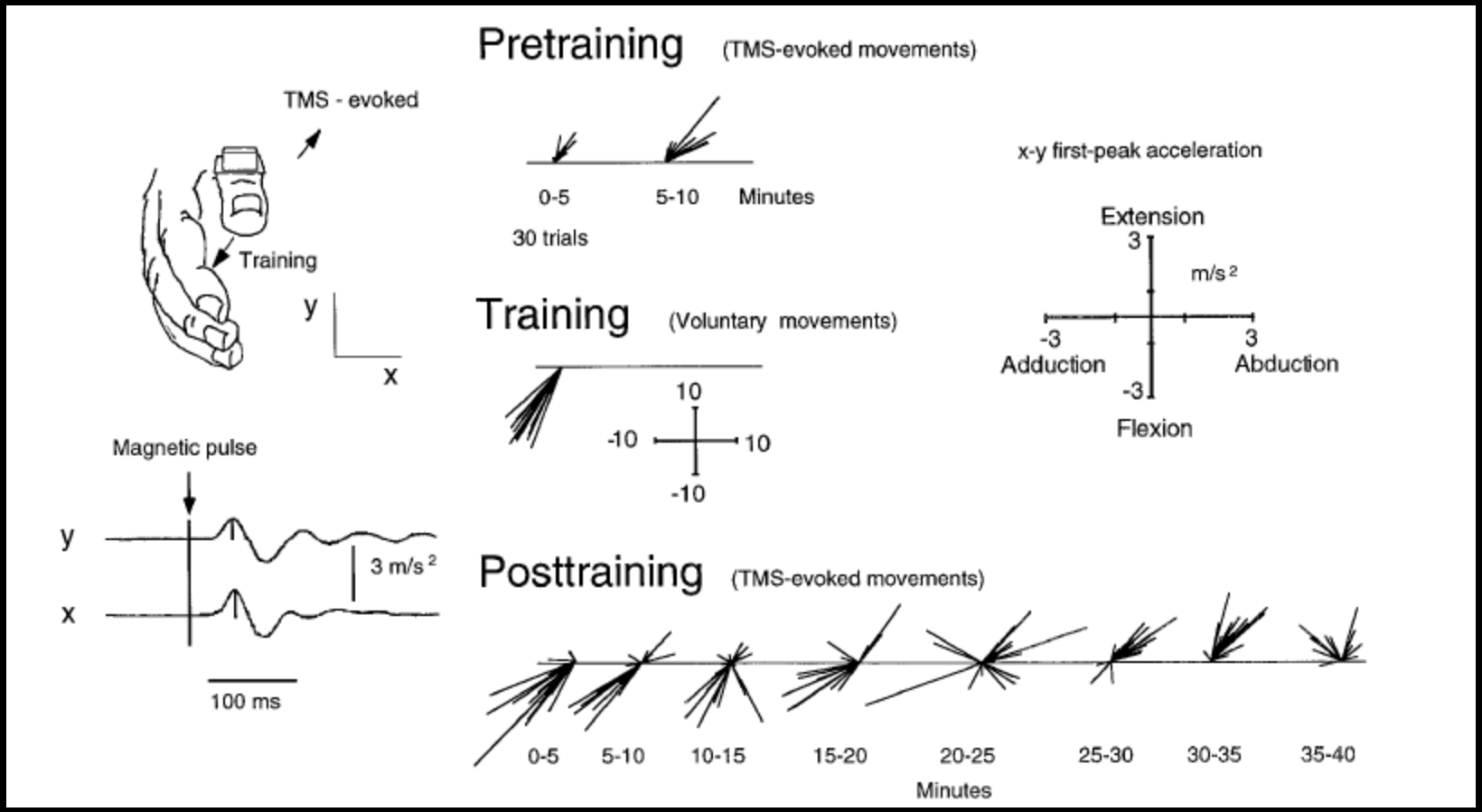
LTD @ PF-PC
decreased AMPA-R





Cerminara et al., 2015

30 minuti di “esercizio” possono modificare la mappa corticale di M1



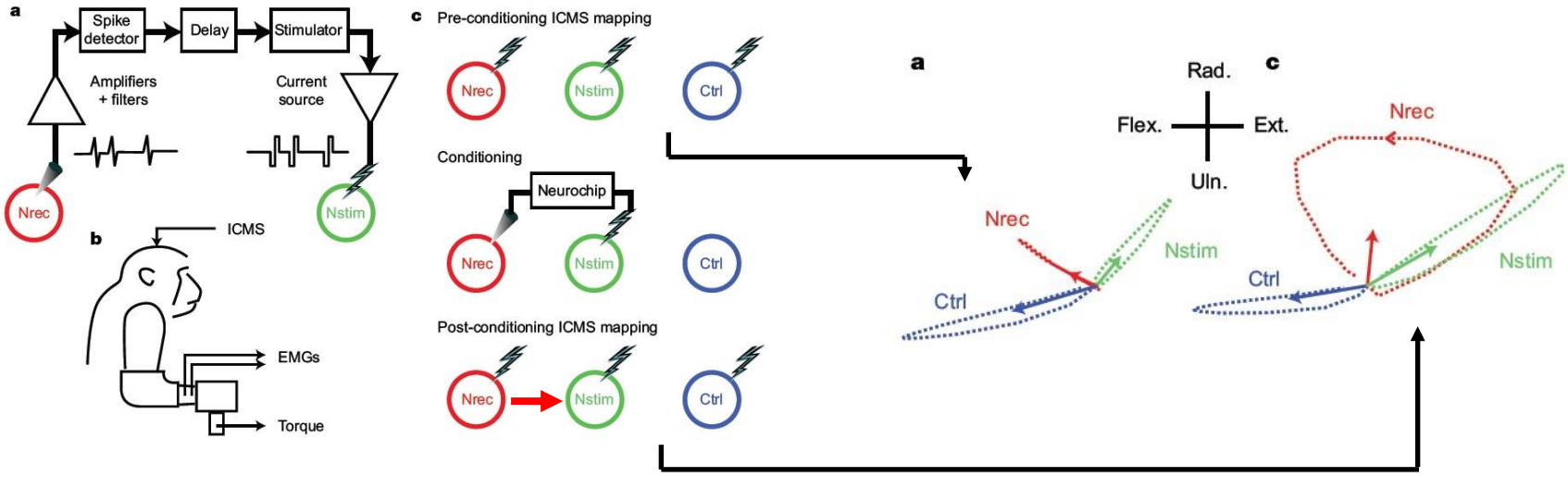
Classen et al., 1998

nature Vol 444|2 November 2006|doi:10.1038/nature05226

ARTICLES

Long-term motor cortex plasticity induced by an electronic neural implant

Andrew Jackson[1], Jaideep Mavoori[2] & Eberhard E. Fetz[1]



Fire together, wire together

?

La plasticità è sempre buona?

Is it really better to have your brain lesion early?
A revision of the “Kennard principle”

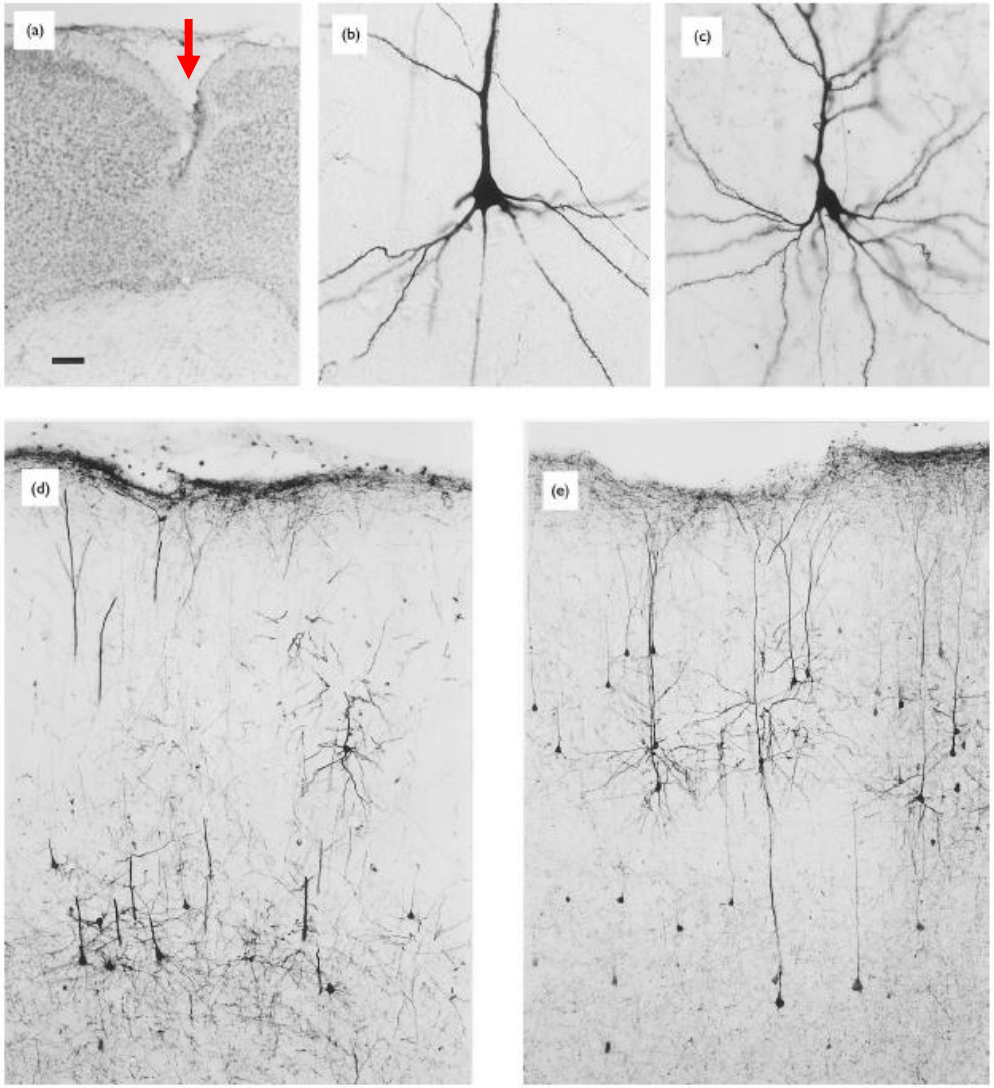
Schneider, 1979

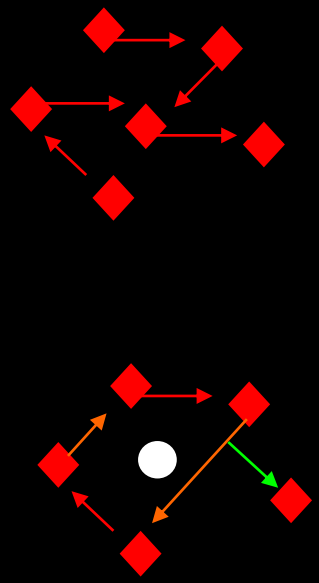
Plasticità (maladattativa)

DEVELOPMENTAL NEUROSCIENCE NEUROREPORT

Organization of cortico-cortical associative projections in a rat model of microgyria

Stefano Giannetti, Pierpaolo Gaglini,[1] Federico Di Rocco,[1] Concezio Di Rocco[1] and Alberto Granato[CA]





Giannetti et al., 2000

Intellectual disability

Neuron
Article

Increased Threshold for Spike-Timing-Dependent Plasticity Is Caused by Unreliable Calcium Signaling in Mice Lacking Fragile X Gene *Fmr1*

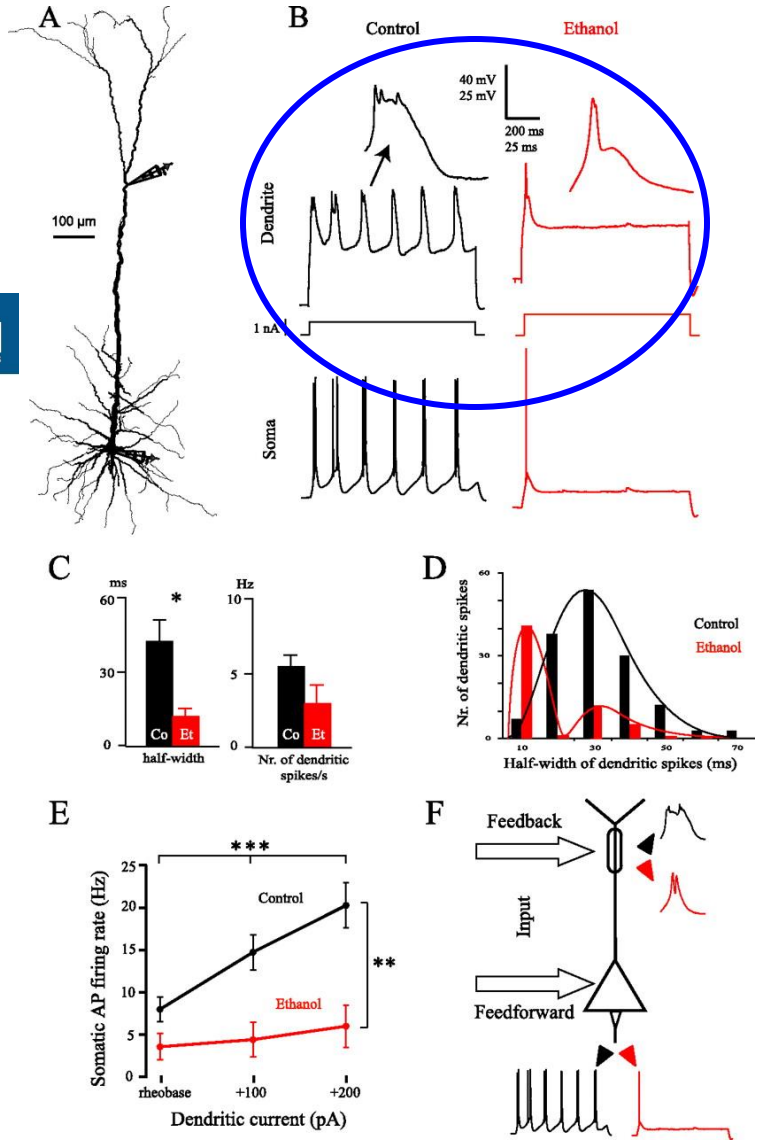
Rhiannon M. Meredith,[1,3] Carl D. Holmgren,[1,3] Meredith Weidum,[1] Nail Burnashev,[1,2,*] and Huibert D. Mansvelder[1,*]
[1] Department of Experimental Neurophysiology
[2] Department of Anatomy and Neurosciences
Center for Neurogenomics and Cognitive Research, VU University Amsterdam, De Boelelaan 1085, 1081 HV, Amsterdam, The Netherlands
[3] These authors contributed equally to this work.
*Correspondence: nail.burnashev@falw.vu.nl (N.B.), huib@cncr.vu.nl (H.D.M.)
DOI 10.1016/j.neuron.2007.04.028

The Journal of Neuroscience, December 11, 2013 • 33(50):19715–19723 • 19715

Development/Plasticity/Repair

Altered Structural and Functional Synaptic Plasticity with Motor Skill Learning in a Mouse Model of Fragile X Syndrome

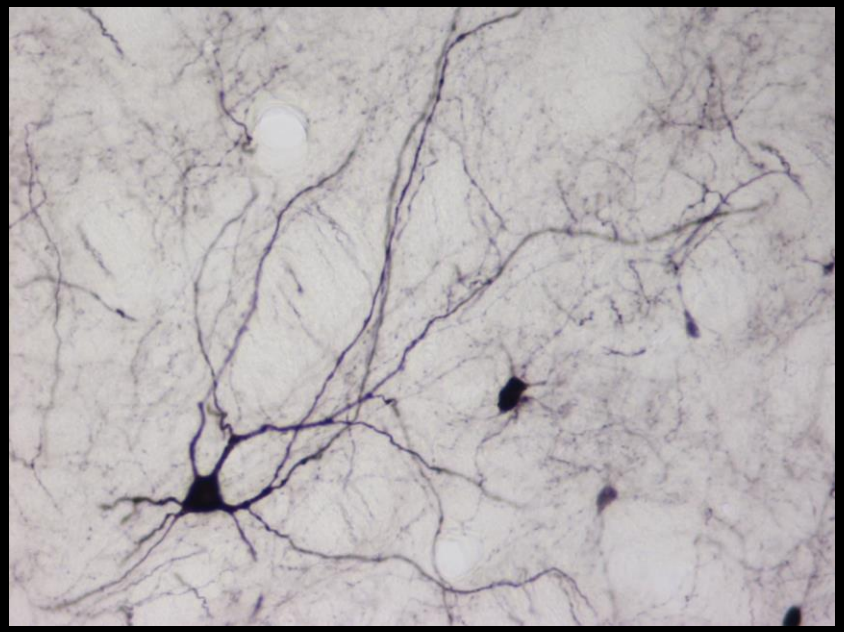
Ragunathan Padmashri,* Benjamin C. Reiner,* Anand Suresh,* Elizabeth Spartz, and Anna Dunaevsky
Department of Developmental Neuroscience, Munroe-Meyer Institute, University of Nebraska Medical Center, Omaha, Nebraska 68198-5960



Ca++

Granato A et al. J. Neurosci. 2012;32:1377-1382

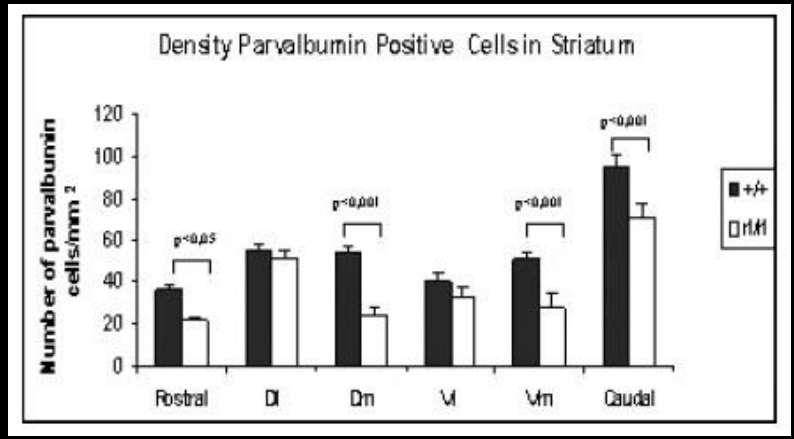
The Journal of Neuroscience



European Journal of Neuroscience, Vol. 24, pp. 2061–2070, 2006 doi:10.1111/j.1460-9568.2006.05083.x

Altered cortico-striatal synaptic plasticity and related behavioural impairments in reeler mice

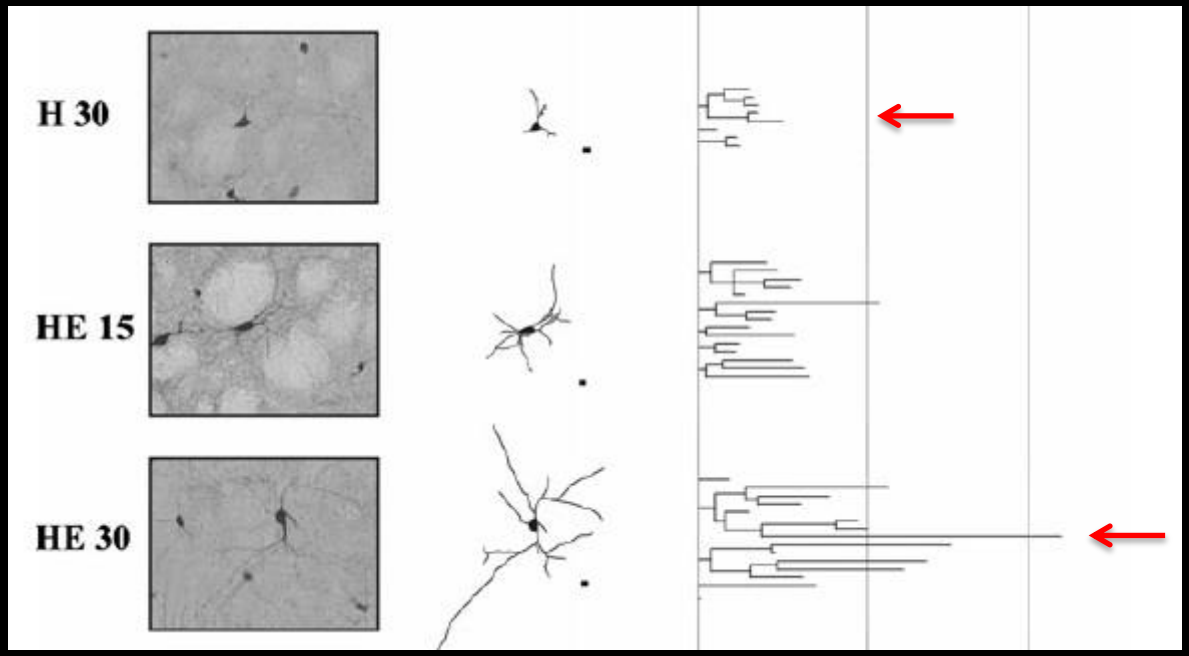
Maria Cristina Marrone,[1] Silvia Marinelli,[1,*] Filippo Biamonte,[2,3] Flavio Keller,[2] Carmelo Alessio Sgobio,[1,4] Martine Ammassari-Teule,[1,4] Giorgio Bernardi[5] and Nicola B. Mercuri[1,5]

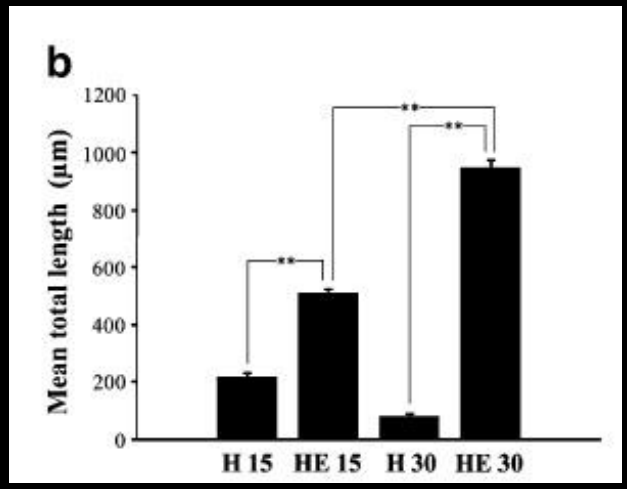


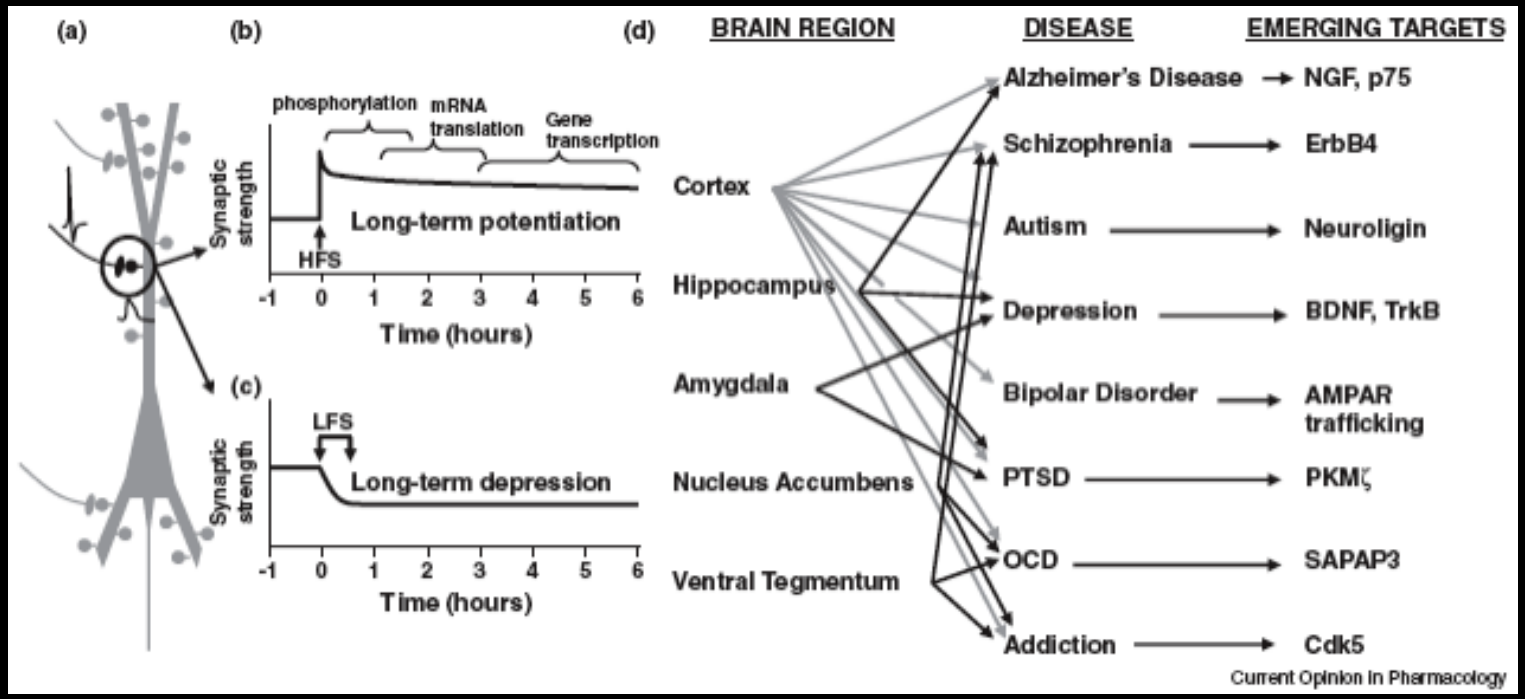
Cerebellum (2011) 10:624–632
DOI 10.1007/s12311-011-0275-0

Plastic Changes in Striatal Fast-Spiking Interneurons Following Hemicerebellectomy and Environmental Enrichment

Paola De Bartolo · Francesca Gelfo · Lorena Burello ·
Andrea De Giorgio · Laura Petrosini · Alberto Granato






(a)
(b)
(c)
(d)
phosphorylation
mRNA translation
Gene transcription
Synaptic strength
Long-term potentiation
HFS
-1 0 1 2 3 4 5 6
Time (hours)
LFS
Long-term depression
BRAIN REGION
DISEASE
EMERGING TARGETS
Cortex
Hippocampus
Amygdala
Nucleus Accumbens
Ventral Tegmentum
Alzheimer's Disease → NGF, p75
Schizophrenia → ErbB4
Autism → Neuroligin
Depression → BDNF, TrkB
Bipolar Disorder → AMPAR trafficking
PTSD → PKMζ
OCD → SAPAP3
Addiction → Cdk5
Current Opinion in Pharmacology