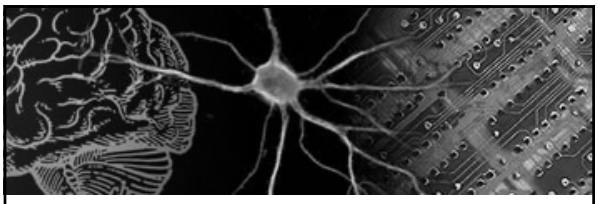


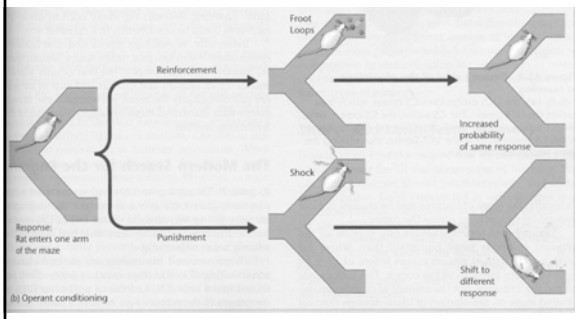
Applied Cognition & Neuroscience

Mātai hinengaro whaipainga

Lecture notes: Physiology of Learning and Memory, 14 May 2008
Dr Robert Isler

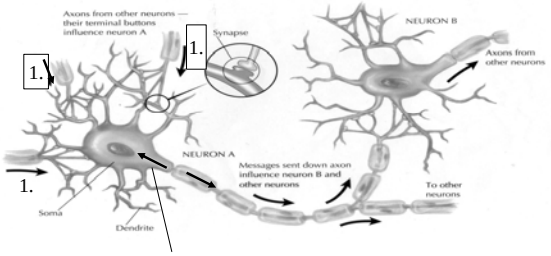
Tsien 2000:

Without memory, one cannot measure learning; without learning, no memory exists to be assessed.



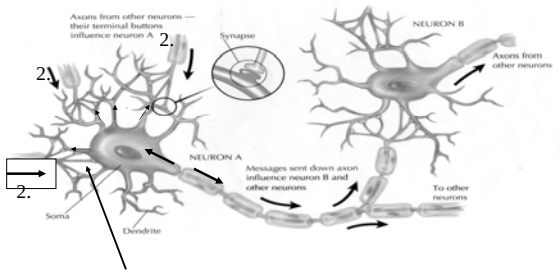
Hebb Rule (1949):
If a synapse repeatedly becomes active at about the same time that the postsynaptic neuron fires, changes will take place in the structure or chemistry of the synapse that will strengthen it.

In pyramidal cells (e.g. hippocampus cells)



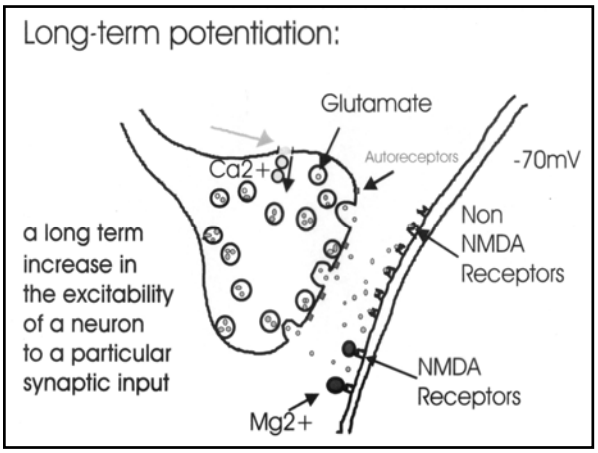
Dendritic spikes: backwash of depolarization

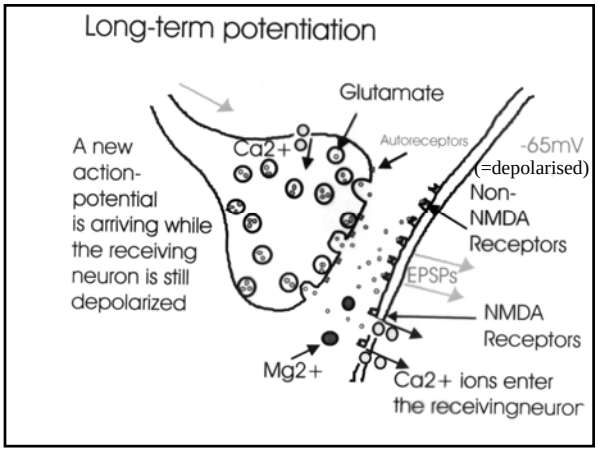
In pyramidal cells (e.g. hippocampus cells)

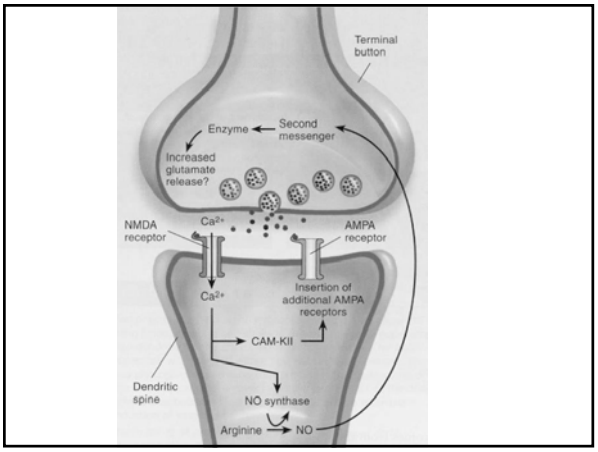


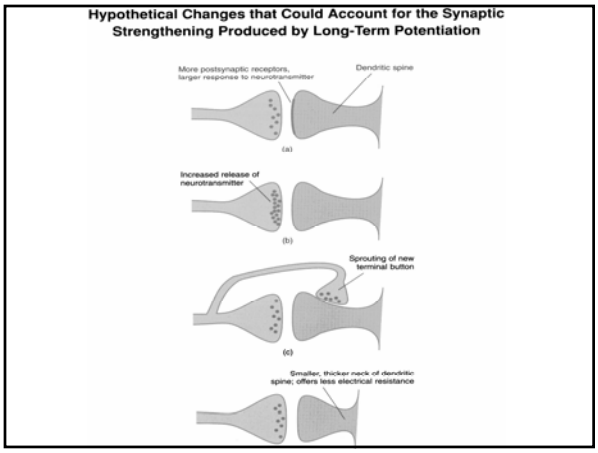
When the second 'wave' of action potentials arrives the dendrites are depolarised causing LPT

Long-term potentiation is a long-term increase in the excitability of a neuron to a particular synaptic input – as a result of learning





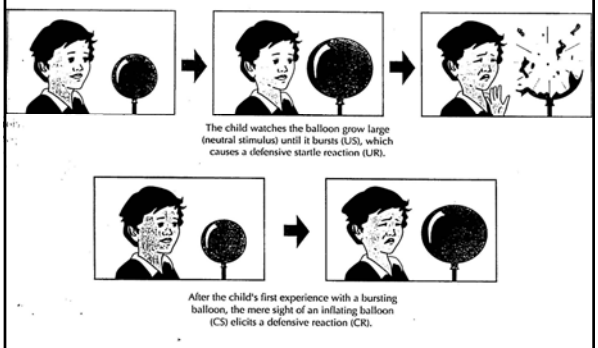


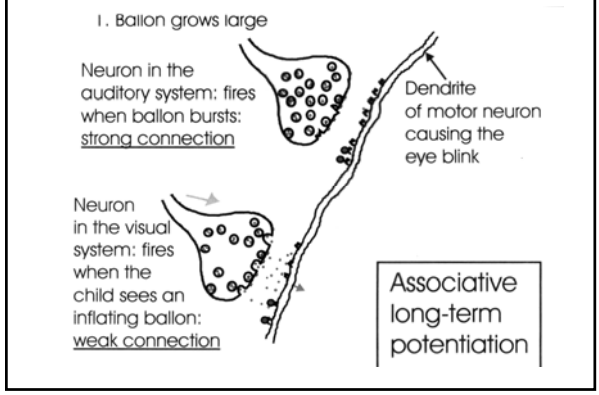


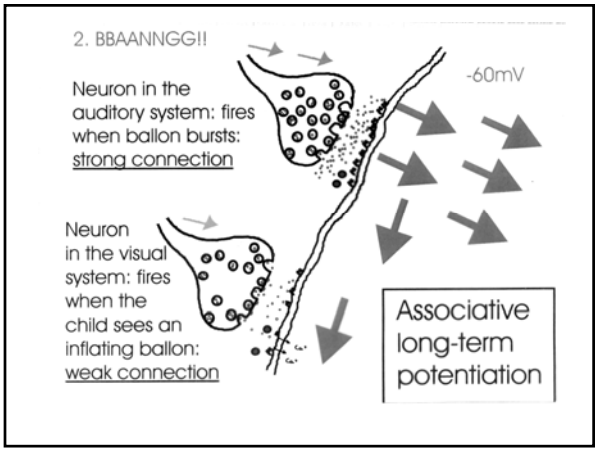
Associative long-term potentiation

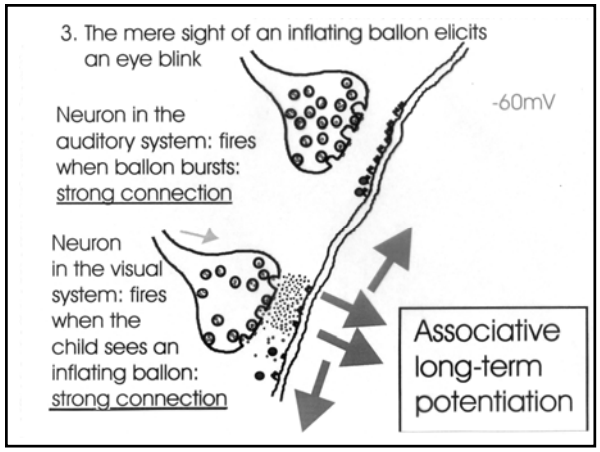
A long-term potentiation in which concurrent stimulation of weak and strong synapses to a given neuron strengthens the weak one

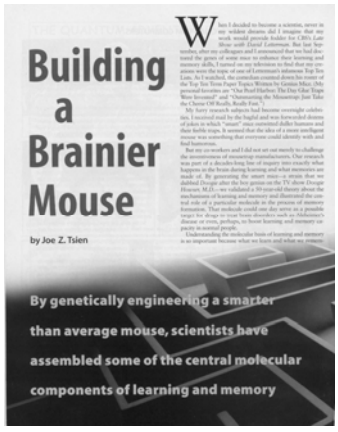
Associative long-term potentiation





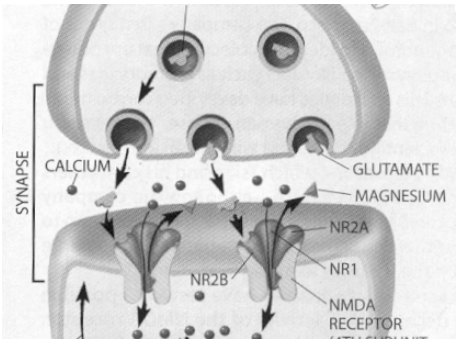




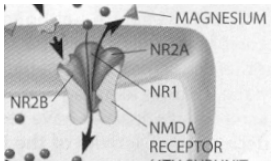


Compulsory reading!

NMDA RECEPTORS



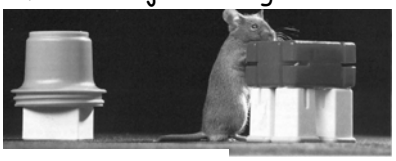
NMDA receptors (are voltage AND transmitter dependent)

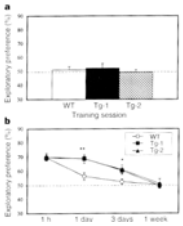


Older mice have plenty NR2A subunits and only a few NR2B subunits in Hippocampus.

NR2B subunits leave the Ca2+ channels longer open => larger EPSPs -> improved learning and memory capabilities.

1. Novel object recognition task





Tsien et al., (2000):

Genetically modified mice carrying the extra copy of the NRB2 gene.

2. Morris water task