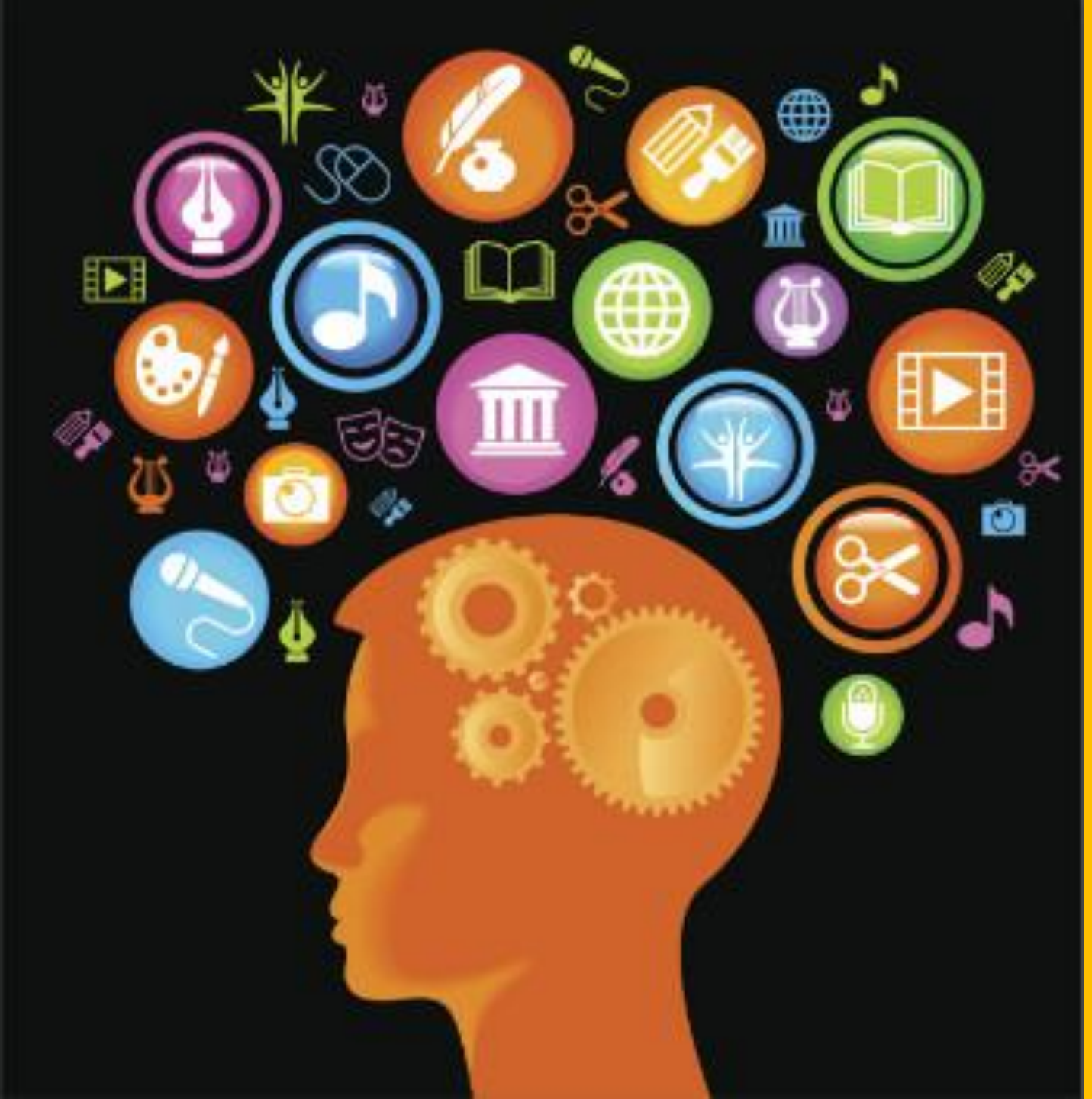
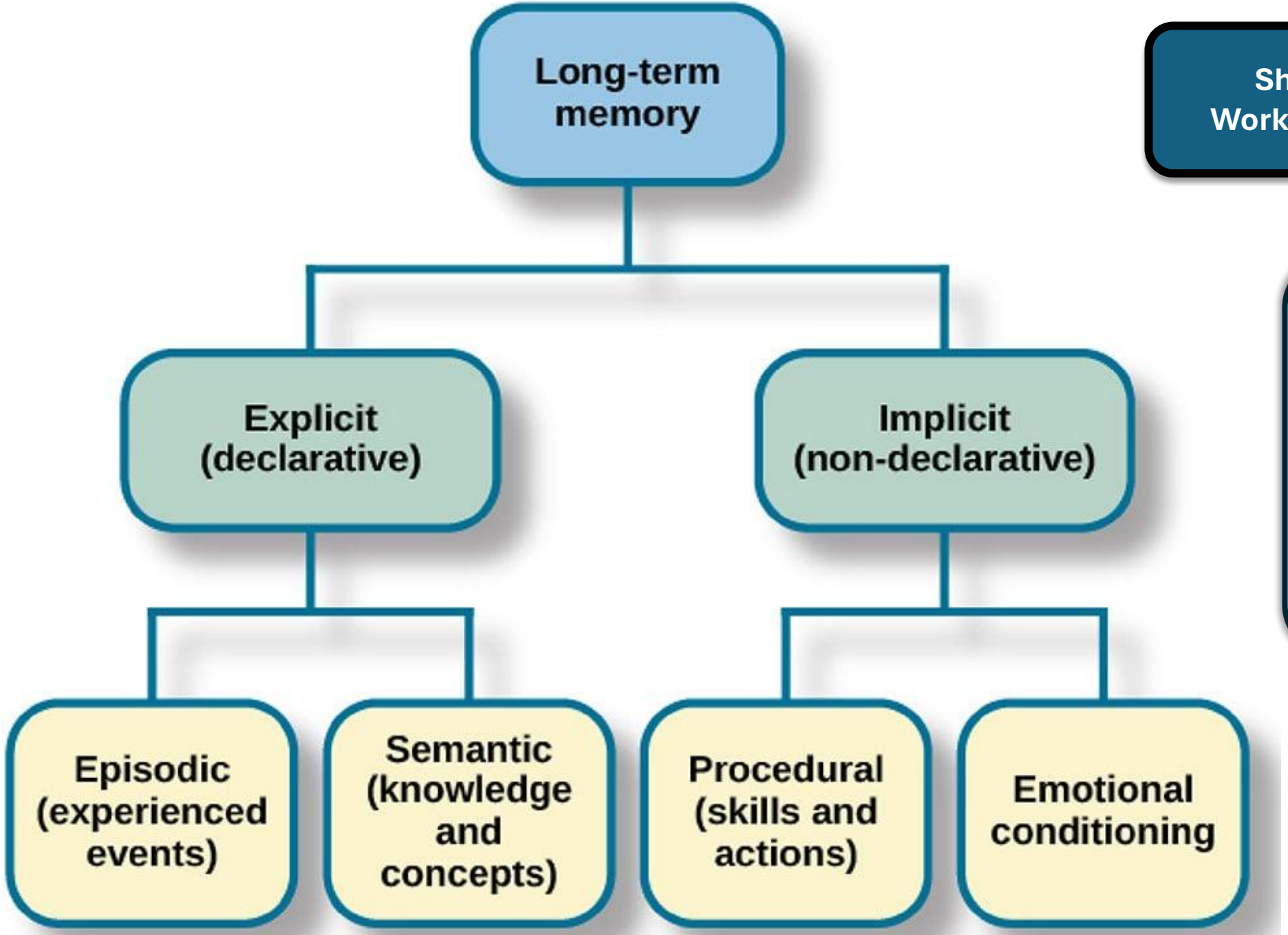


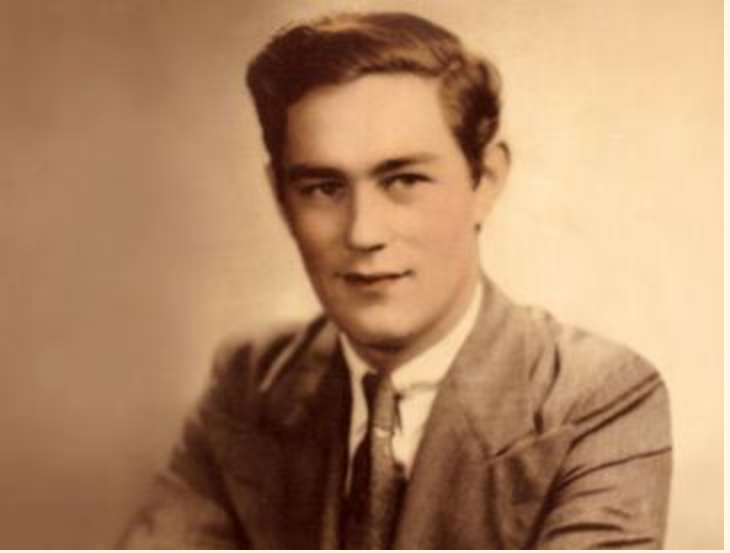
Knowledge category 4

Learning
Memory
&
Language



Short-term Working Memory

system for temporarily storing and managing information required to carry out complex cognitive tasks

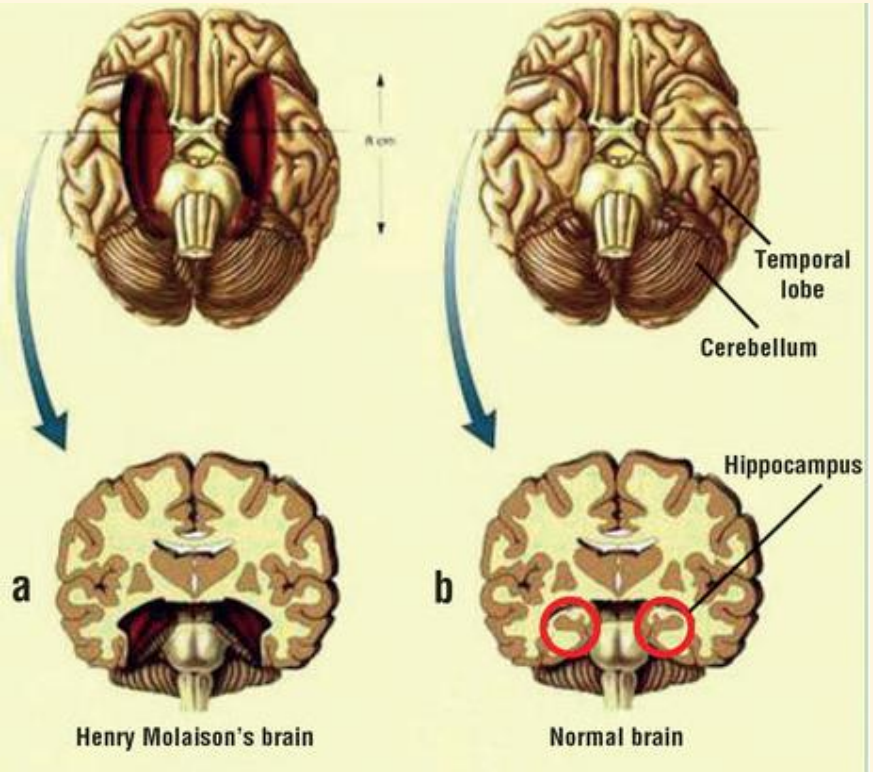


Who remembers the story of HM?

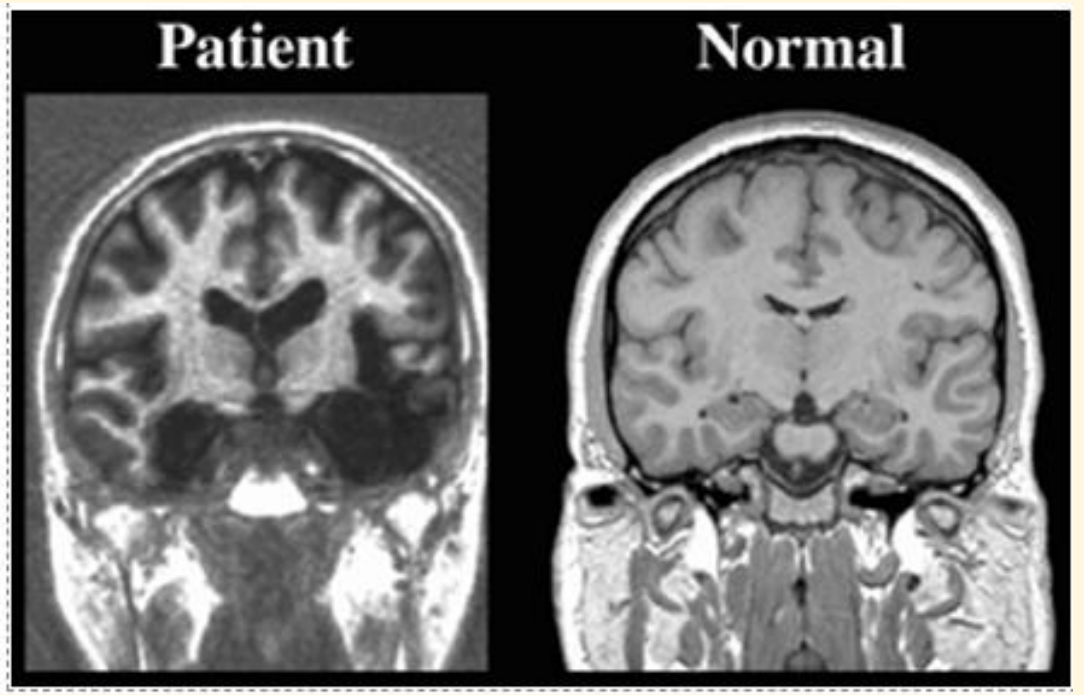
Retrograde

Anterograde

Clive Wearing - encephalitis
Damage to hippocampi, amygdalas, mammillary bodies, and temporal poles – abnormalities in left fornix, left medial frontal cortex.



Damage to one structure does not limit itself to the loss of what that structure does. Why?



Brain Mechanisms

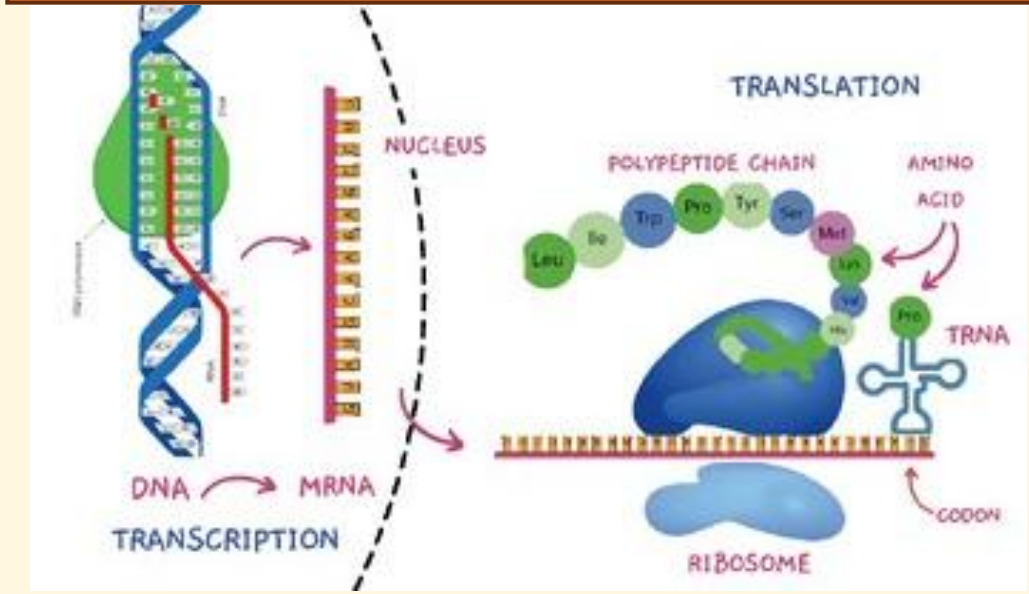
structure	function
Temporal lobes	Encoding, storage, retrieval of long-term declarative memories Left: verbal memory Right: non-verbal memory
Hippocampus	Consolidates short-term into long-term memories but does not store them. Spatial memory. Works with temporal lobes, prefrontal cortex & thalamus – declarative memory
Amygdala	Fear conditioning. Adding emotional significance to memories. Recall of traumatic events
Prefrontal cortex	Episodic and prospective memory (remembering to remember), constructive memory, false recognition. Dorsolateral prefrontal cortex – working memory
Thalmus	Anterograde and retrograde amnesia, confabulation
Basal ganglia	Procedural memory, implicit memory

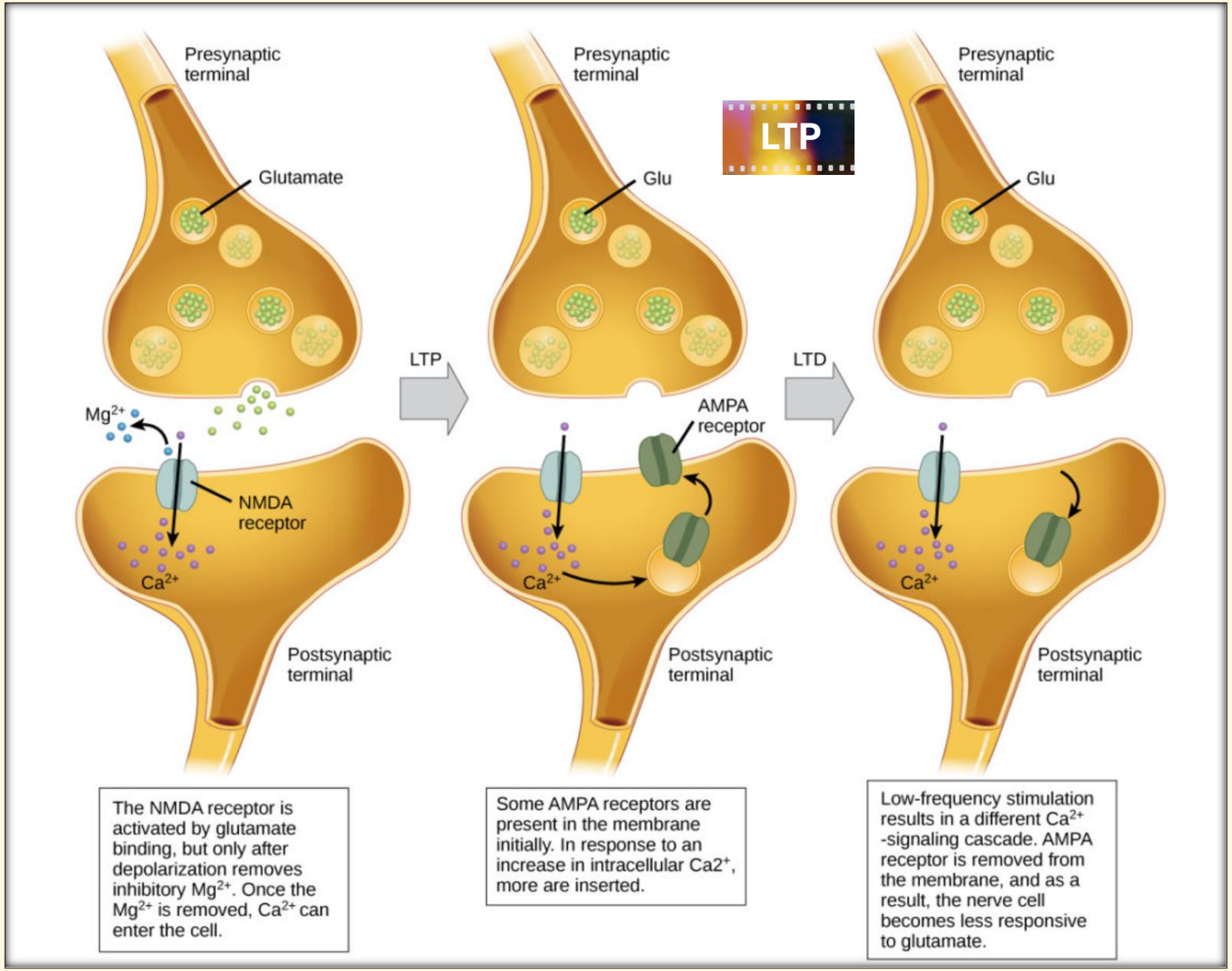
Neural Mechanisms

Short-term memory = neurochemical changes at the synapse

Long-term memory = neurochemical changes at the synapse, changes in the number and arrangement of synapses, LTP, and protein synthesis

Protein synthesis: proteins are created minutes to hours after learning. Blocking this prevents formation of long-term memories





Long-term potentiation (LTP): a barrage of high freq stim leads to increased response of the postsynaptic neuron to weak stim later on. This lasts days and weeks. Observed in the hippocampus, amygdala, cortex

Language

Left-side dominant for most

Right hemisphere also participates in language production & comprehension

Broca and Wernicke's area are in the left hemisphere for most people

Broca: **involved in speech production and comprehension (to a lesser extent) coordinates movements needed for speech**

Wernicke's: **speech comprehension**