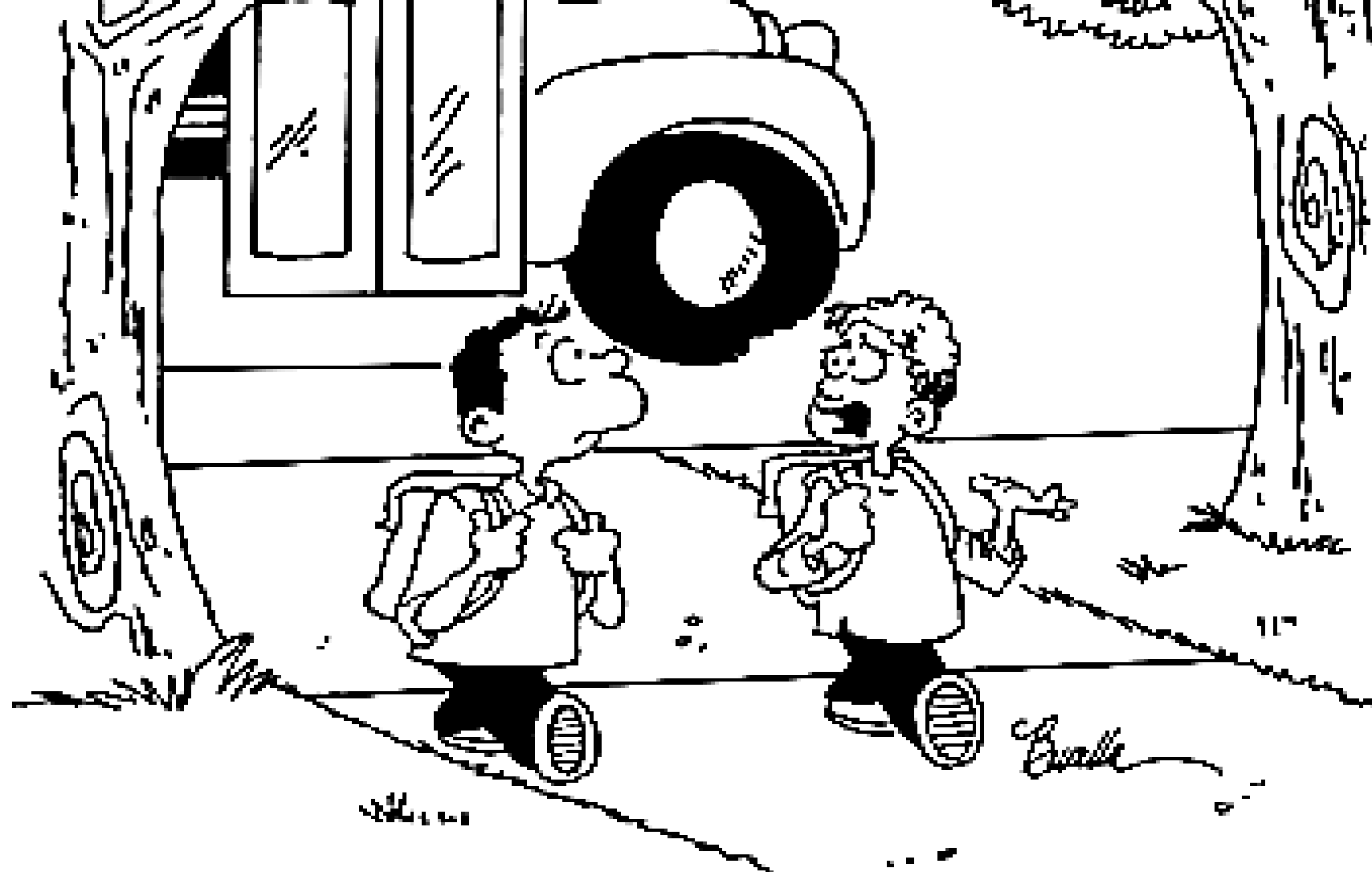


Memory and Learning

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"Want to hear something scary? This is the third time this week I've gotten off the bus and still remember what I learned."

Learning

- Ability to **alter behavior** on the basis of experience
- Learning is the acquisition of this information
- **Memory** is the ability of **storing this information**

Memory

EXPLICIT [declarative]	IMPLICIT [non declarative]
Conscious recall of information e.g. names, facts	Not dependent on conscious recall e.g. Pavlovian reflex

Explicit memories become implicit
later e.g. Learning to cycle

Explicit Memory

- **Episodic**: Remembering events e.g. the day you heard that you got in to medical school
- **Semantic**: Remembering facts such as words, rules, anatomy!!
- **Hippocampus, medial temporal lobe**

Implicit memory

- No awareness of these memories
 - Skills, habits, reflexes
- Stored in different areas of the brain including the basal ganglia and cerebellum [does not involve hippocampus]

Explicit Memory [& some implicit memory]

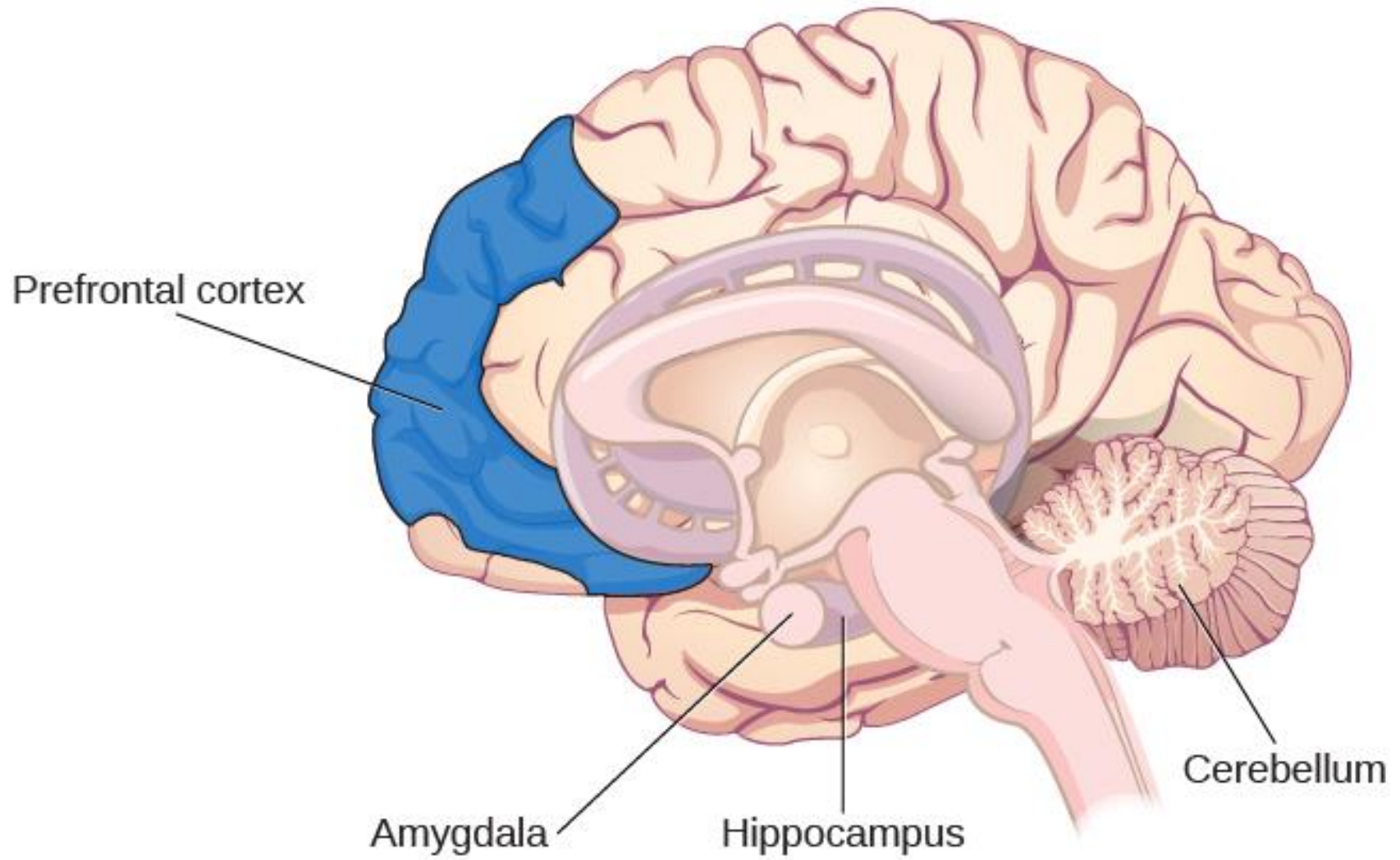
Short term: stored in prefrontal cortex



Processing in hippocampus and
other parts of medial temporal lobe



Stored as long term memory
in parts of neocortex



- Other areas are also involved in memory storage
- Mammillary bodies
 - Damaged in chronic alcoholics
- Amygdala
 - Emotionally charged memories
- Short term memories can be disrupted easily (drugs, trauma) but long term memory is resistant to disruption

Mechanisms of storage and recall of memory

- Synaptic connections strengthened or weakened on the basis of past experience [synaptic plasticity]
 - Pre or post synaptic effects
- Requires protein synthesis for long term memory
 - Can be prevented (hypothermia, electric shock)
- Recall stimulated by different associations (e.g. sights, smell, sound) and has an emotional component

Mechanisms of Synaptic Plasticity

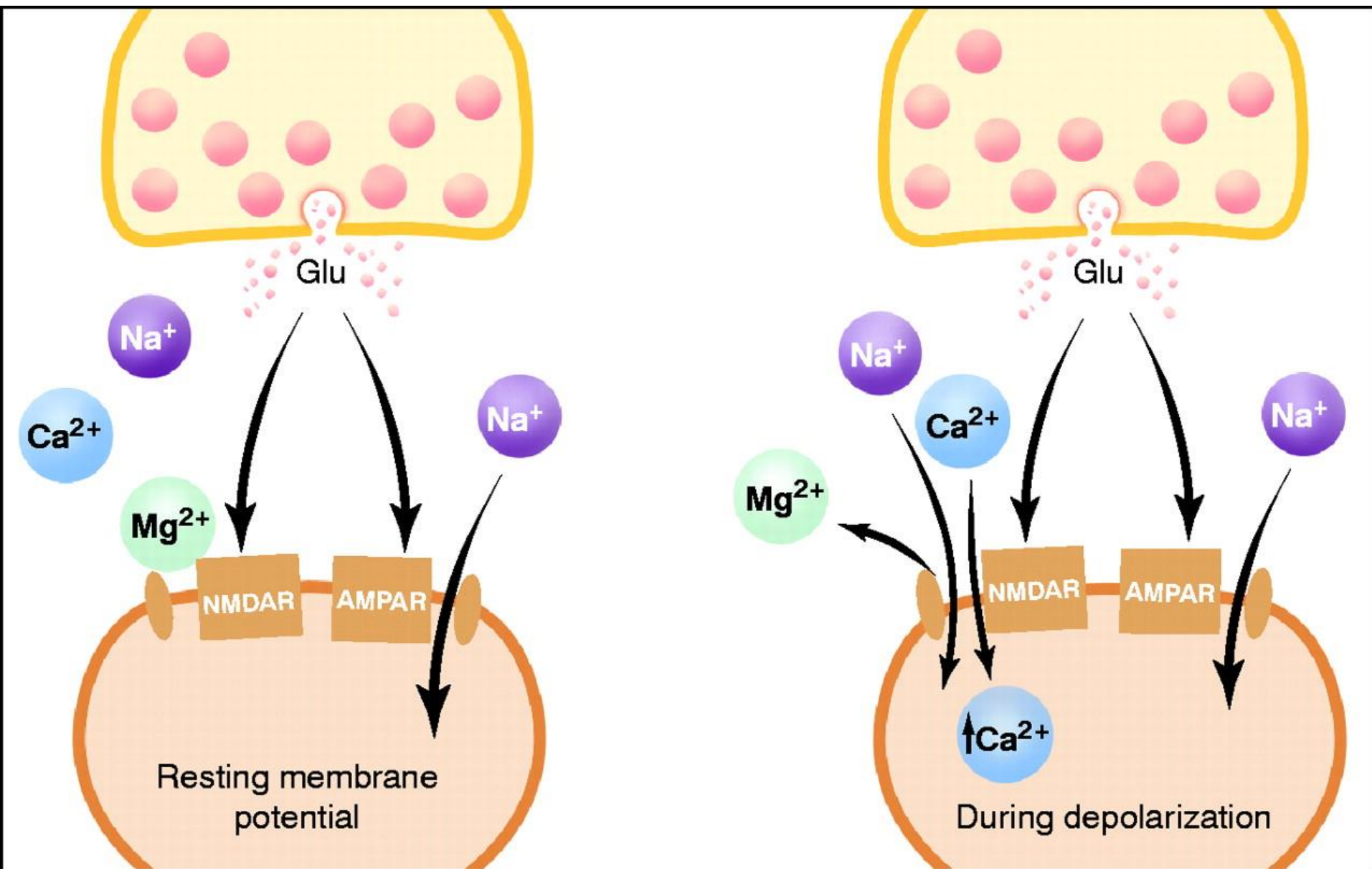
- **Posttetanic potentiation**
 - Tetanising stimuli increases Ca^{++} in presynaptic neuron; causes greater post synaptic potentials [lasts ~60s]
- **Habituation**
 - Repeated stimulation causes less/ no response
 - Calcium channel inactivation \rightarrow reduced Ca^{++} entry \rightarrow Reduced neurotransmitter release
- **Sensitisation**
 - \uparrow post synaptic potential in response to noxious stimulus; using presynaptic facilitation. Short term (e.g \uparrow cAMP) or can be long term (synthesis of protein for growth of synaptic membranes)

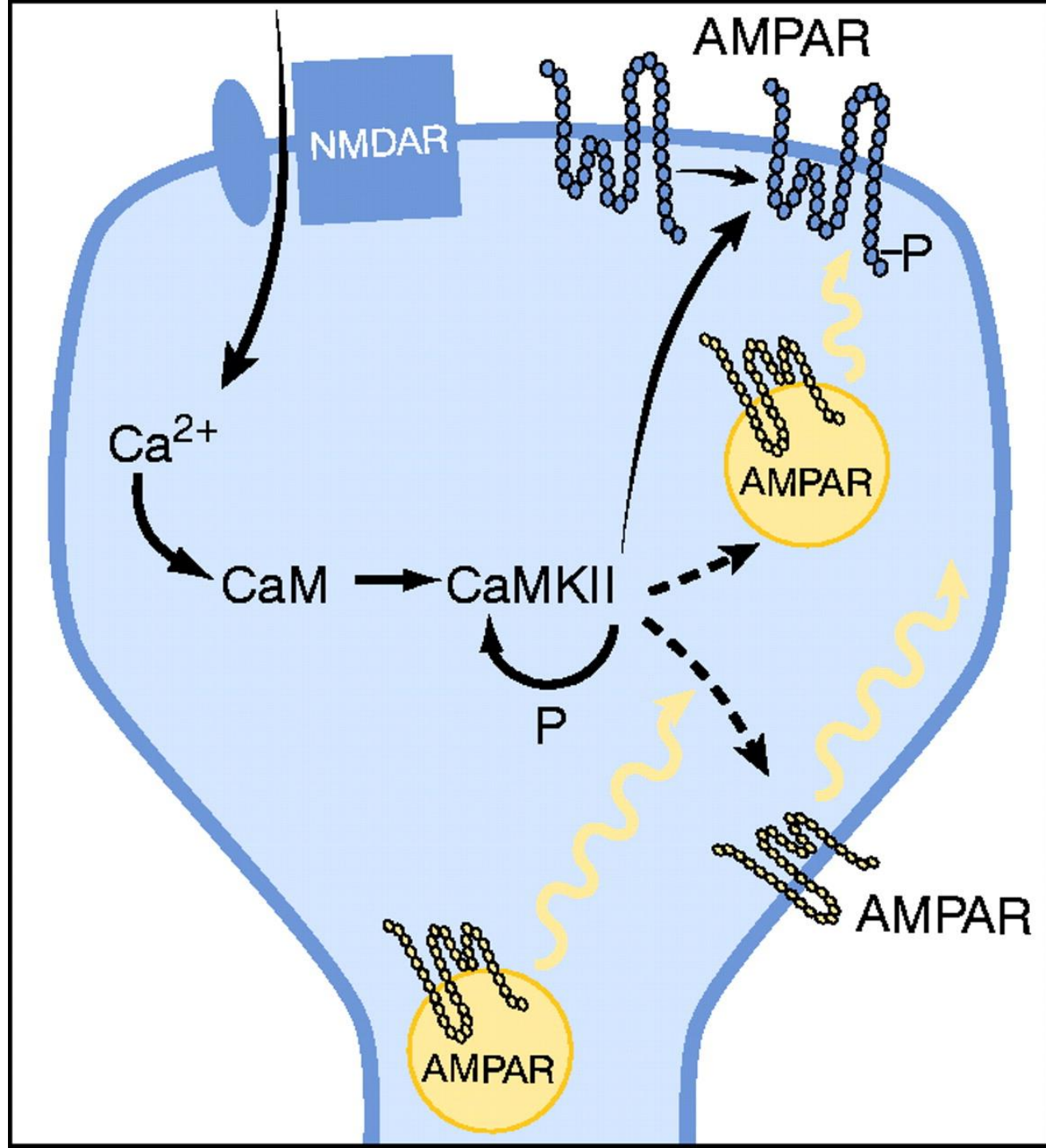
Long term potentiation

- Rapid presynaptic stimulation causes an increased post synaptic potential [more prolonged than posttetanic potentiation] usually by increased pre & post synaptic membrane Ca^{++} influx

Read up

- Role of NMDA and AMPA receptors in post synaptic membrane
- Long term depression





Loss of memory

“Amnesia”

- Damage to the mamillary bodies in alcoholics
- **Alzheimers disease**: reduced **acetyl choline** secreting neurones projecting from the basal forebrain to the neocortex, hippocampus, amygdala
- Affects **recent memory**

