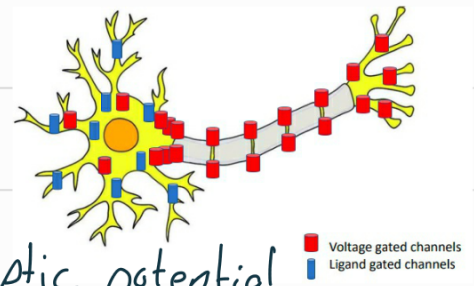
Synapses

- axo dendretic synaps
- axo somatic synaps
- axo axonic synaps

neuron

- dendrids + soma = input zone
- integrative zone
- conductive zone

* most ligand-gated channel in the input zone but the voltage-gated channel in all neuron and few in and density in axon hillock has 7 times more than soma which AP generated in ↑



* graded potential is called post synaptic potential

if the total of graded potential is

- negative
  it will hyperpolarize
  hyperpolarizing
  Cl^- ← influx
  K^+ ← eflux
- positive
  it will depolarize
  ⇓
  but AP will not generate except if the depolarize of graded potential reach the thrishold

depolarizing
influx of Na^+

So it is great opportunity for summation of signals

* the soma is large spatial feild of excitation

Dendrites can't transmit action potential
↳ is leaky for ion so the great part of excitatory potential will be lost to reach the soma due to long length of it

farther excitatory from soma ⇒ greater decrement
lesser excitatory reaching the soma

post synaptic potential

excitatory (EPSP)
* increase the voltage above the resting potential
(if reach the threshold it will generate Action potential)

EPEP = +20 ⇒ 20 mV above resting potential

inhibitory (IPSP)
* opening k^+ or cl^- channels

IPSP = -20 ⇒ 20 mV more negative than resting potential

* Soma is Large in diameter (more conductance) and it has Uniform distribution of membrane potential

Resting membrane potential in AMN = -65 mV

* excitation of Single pre synaptic neuron Almost never excite the neuron because transmitter released by it will cause EPSP no greater than 0.5 – 1 mV but we need 10 – 20 mV

So we have spatial summation (wide space area) and we can has temporal summation if pre synaptic neuron

has the ability to discharge rapidly more than 15 mSec
So when excitatory synapse excite the neuron the membrane will be heighly permeable to Na for 1 or 2 msec so the Na enter and create EPSP then it need 15 mSec to leake all positive charge and return to RMP And vise versa for IPSP but instead of Na the IPSP increase permeability of K^+ and Cl^-. and we can increase this period By change the transmitter ⇒ especially neuropeptide

IPSP

postsynaptic ⟷ pre synaptic

postsynaptic ⇓ as we learneed

pre synaptic ↳ Almost by axon axonic synaps

So GABA is most used in this state ⇒ enter Cl^- in presynaptic neuron

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in presynaptic inhibition the Cl^- enter the cell ⟶ no Action potential ⟶ no Ca^{2+} channel open ⟶ no transmitters released ⟶ no transmission

* imagine neuron has excited near the threshold but did not reach it (دزّه يعني بس) so we called it faciliated neuron So the next stimulus will be (دزّه) and some times we need this state when we want fastor easy excitment in neuron

State of excitation

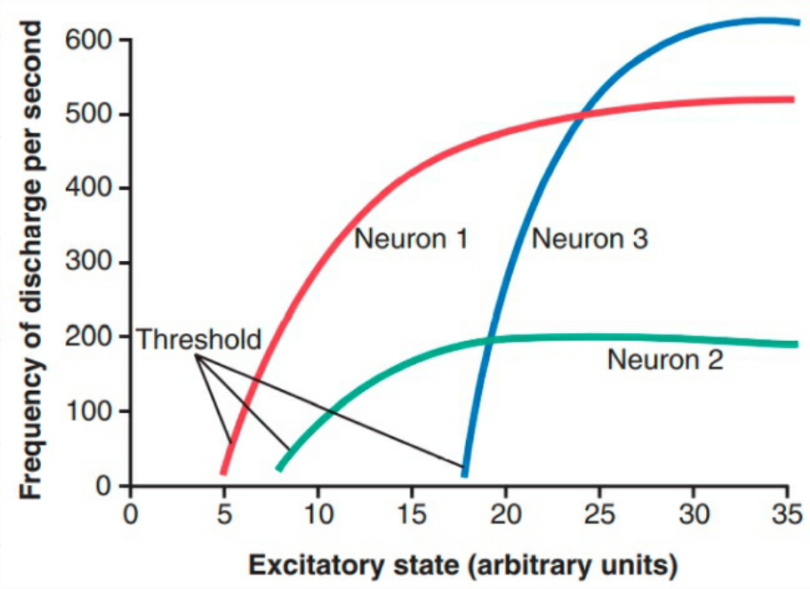
excitatory state ⟷ inhibitory state

excitatory state: when sammation is excitatory and delivered to neuron

So if excitatory state raise above the threshold the neuron will fire reptitively as long as the excitatory state remains at that level

inhibitory state: there is more inhibition than excitment

- Figure shows responses of three types of neurons to varying levels of excitatory state.
- Neuron 1 has a low threshold for excitation, whereas neuron 3 has a high threshold.
- Neuron 2 has the lowest maximum frequency of discharge, whereas neuron 3 has the highest maximum frequency.



* Does this neuron has Action potential ?