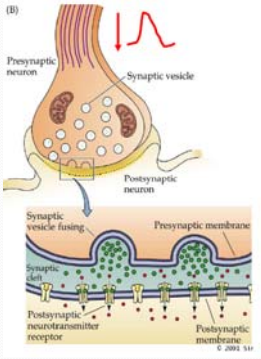
Synaptic Transmission

Presynaptic Events

1. Action potential invades axon terminal
2. Activates voltage gated calcium channels
3. Calcium influx increases *probability* of vesicle release

Postsynaptic events

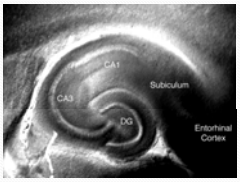
1. Transmitter binds to receptor
2. The receptor
   1. Opens ion channel (ionotropic) or
   2. Activates 2nd messenger pathway (metabotropic)

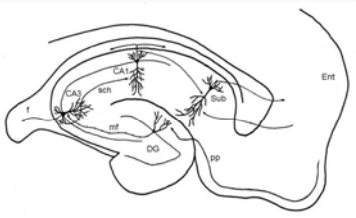


Synaptic transmission: Critical features

- Vesicle release is probabilistic
- Vesicle release is regulated by calcium
- Transmission is highly plastic at both the presynaptic and postsynaptic membranes
- Timing is crucial

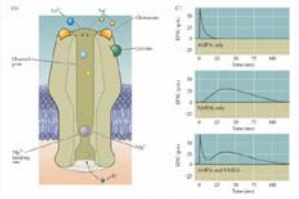
Hippocampal network





Glutamate receptors

1. Most prevalent excitatory receptors in the CNS, esp Hippocampus
2. Three general classes: AMPA, NMDA, and Kainate
3. Numerous variations within each class



AMPA receptors:

1. Very fast currents, selective for sodium and potassium (E_{rev} ~ 10 mV)

NMDA receptors

1. Slow persistent currents, permeable to sodium, potassium and calcium (E_{rev} ~ 10 mV)
2. Require Glycine as co-transmitter
3. Magnesium block must be removed for activation

Experimental approach

1. Locate a rich region of CA1 pyramidal cells under 40x
2. Do NOT move the stage. Never.
3. Switch to 10x and place stimulating electrode over the *Stratum radiatum* of CA3 (Schaffer collaterals). Get it close to the surface without touching the tissue.
4. Return to 40x and locate the pyramidal cell you plan to patch.
5. Slowly lower the stimulating electrode until you see the tissue move.
6. Proceed with experiment.