Lecture 5 Neuroanatomy

— All thoughts action potentials, all thinking biochemical processes!
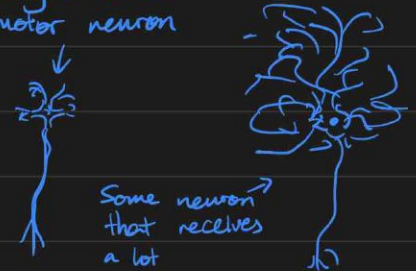
#1 Cells in Brain

* **Neurons**

Dendrites — receive messages

Nucleus

Axon — sends message (only one per cell)

Myelin — helps insulate speeds up messaging

Direction of signal

Can see structure using Golgi stain

* **Different cell function, different dendrite/axon ratio!**

Maybe some motor neuron

Some neuron that receives a lot

* **Glial cells** — more than neurons, behind the stage crews!

  - **Astrocytes**
    barrier astrocytes
    1. Maintain blood || brain barrier
    2. ⟵ supply nutrients
    3. ⟶ grab trash
    4. clean dead neurons
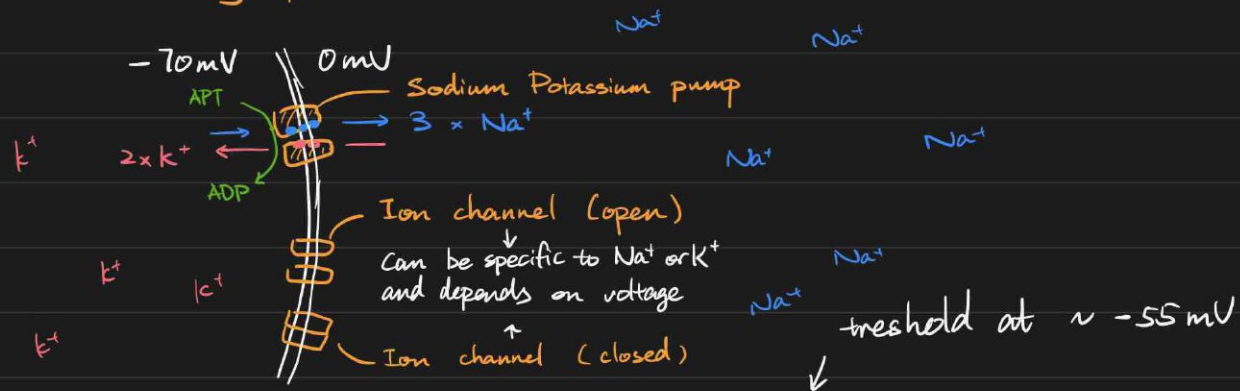   5. ⊙ → ⊙⊙ create new glial stem cells

  - **Oligodendrocytes**
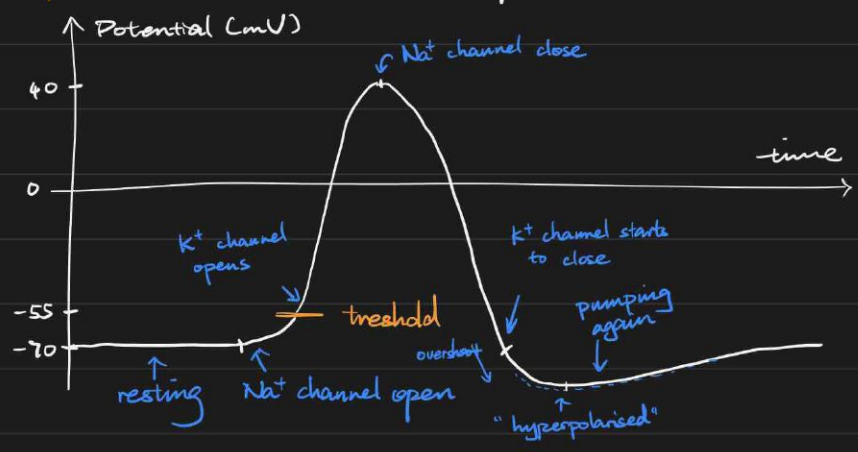   1. Produce myelin ⟶

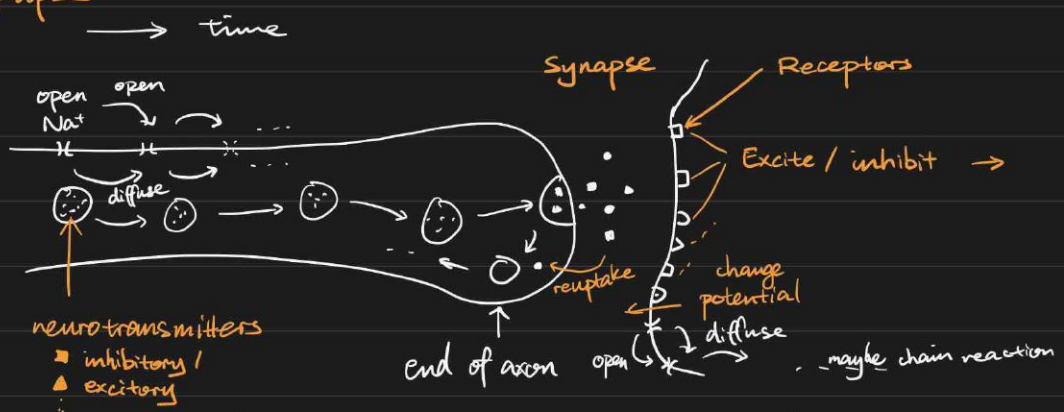Glial : neuron ratio different at different places of the brain!

#2 Neural Communication

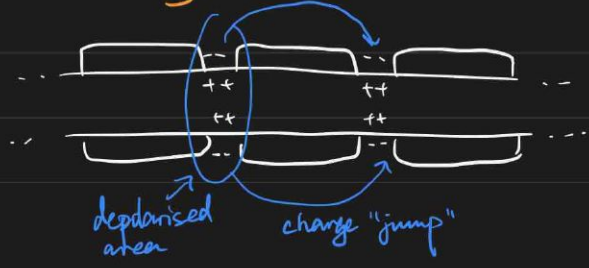* **Resting potential:** -70 mV inside relative to outside

- -70mV ‖ 0mV
- APT
- K^+ $2 \times K^+$ ADP
- K^+ K^+ K^+
- Sodium Potassium pump
- $3 \times Na^+$
- Ion channel (open)
  - Can be specific to Na^+ or K^+ and depends on voltage
- Ion channel (closed)
- Na^+ Na^+ Na^+ Na^+ Na^+ Na^+ Na^+ Na^+
- treshold at ~ -55 mV

* **Depolarisation** — when input triggers charge movement chain reaction

- ↑ Potential (mV)
- 40
- 0
- -55
- -70
- time
- Na^+ channel close
- K^+ channel opens
- K^+ channel starts to close
- pumping again
- treshold
- overshoot
- ↑ resting
- ↑ Na^+ channel open
- ↑ "hyperpolarised"

* **Synapse**

- → time
- open open Na^+
- diffuse
- neurotransmitters
  - ■ inhibitory /
  - ▲ excitory
- end of axon open
- Synapse Receptors
- Excite / inhibit →
- reuptake
- change potential
- diffuse
- ... maybe chain reaction

* **Saltatory conduction** — how myelin speeds up charge propagation

- ++ ++
- ++ ++
- depolarised area
- charge "jump"

#3 Neurogenesis and Brain Damage

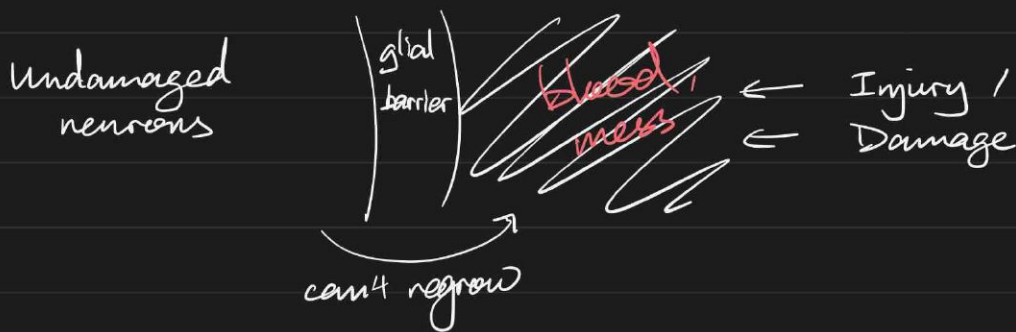Dead neurons can't receive transmitters (uh oh)

* **Cell Death**
    - Apoptosis — programmed cell death
   - Injury / trauma
    - Diseases
* **Brain Repair**
    - Undamaged neurons form new connections
    - Damaged axons regrow ← ↑
    - New neurons   Hard if original axon very long
* **Glial scars** — blood kills neurons!

Undamaged neurons | glial barrier | Blood mess ← Injury / ← Damage

can't regrow

* **Alzheimer's** (partially env partially DNA)
    - Starts by destroying hippocampus → memory
    - Cell death due to abnormal protein deposit

protein buildup   ← won't degrade
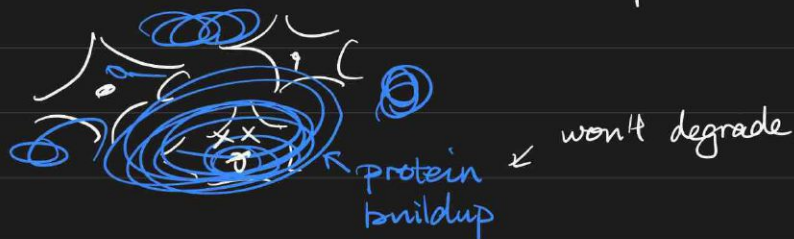
* **Ghost neurons** — things in shape of neurons that died ...

weepy?