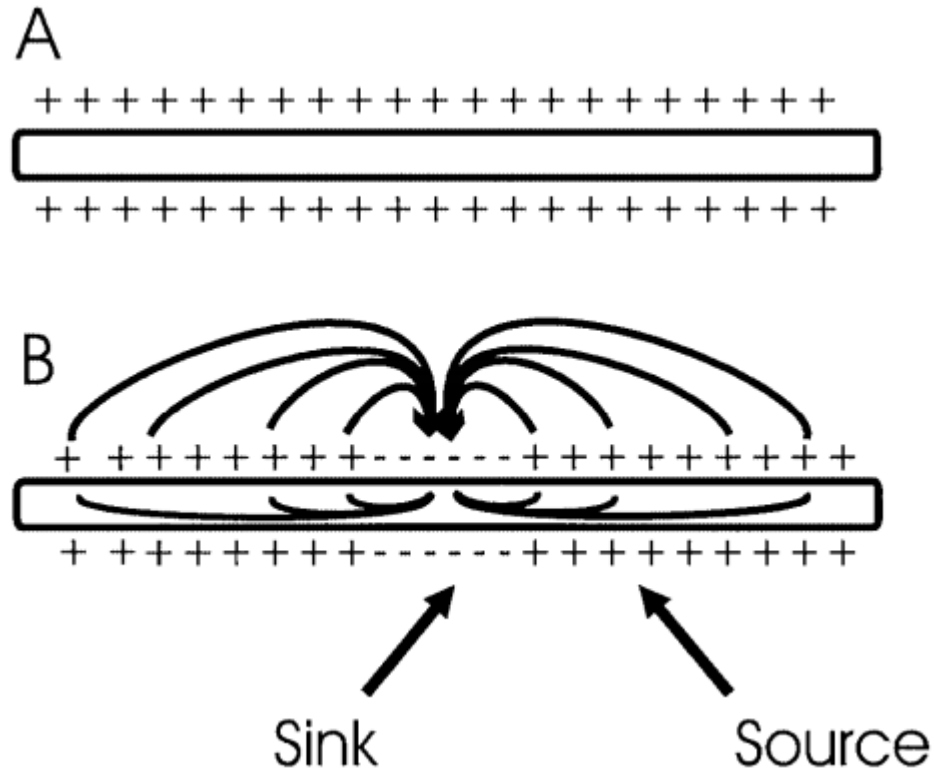


# **Part 1: current-source density**

# Extracellular “spike”

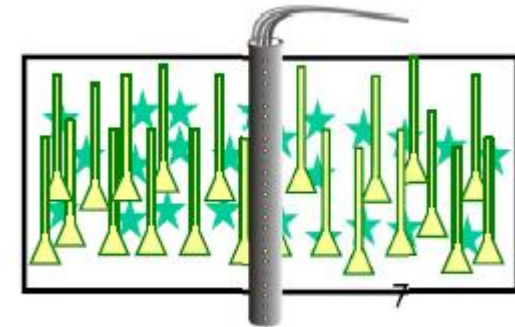
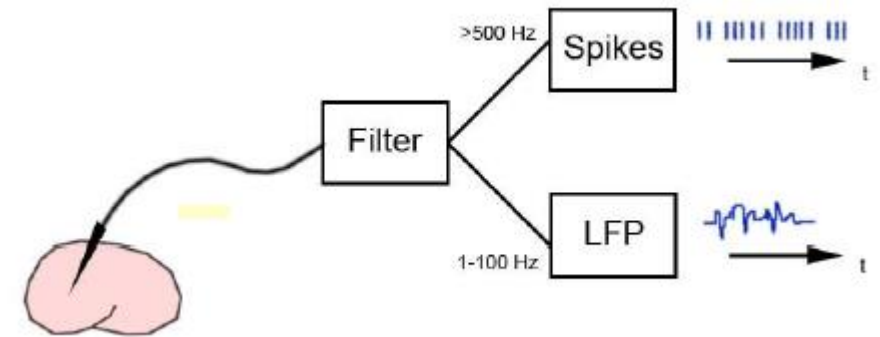


- (a) When the axon is at rest, the membrane potential is uniform, and no current flows.
- (b) Current will flow when a segment of the membrane is depolarized. The flow is inward at the depolarized region (**sink**: a site on the neuronal membrane where positive charges enter the neuron.) and outward at adjacent regions, which act as a “**source**” (positive charge flows out of the neuron, for negative charge, sink and source are inverted).

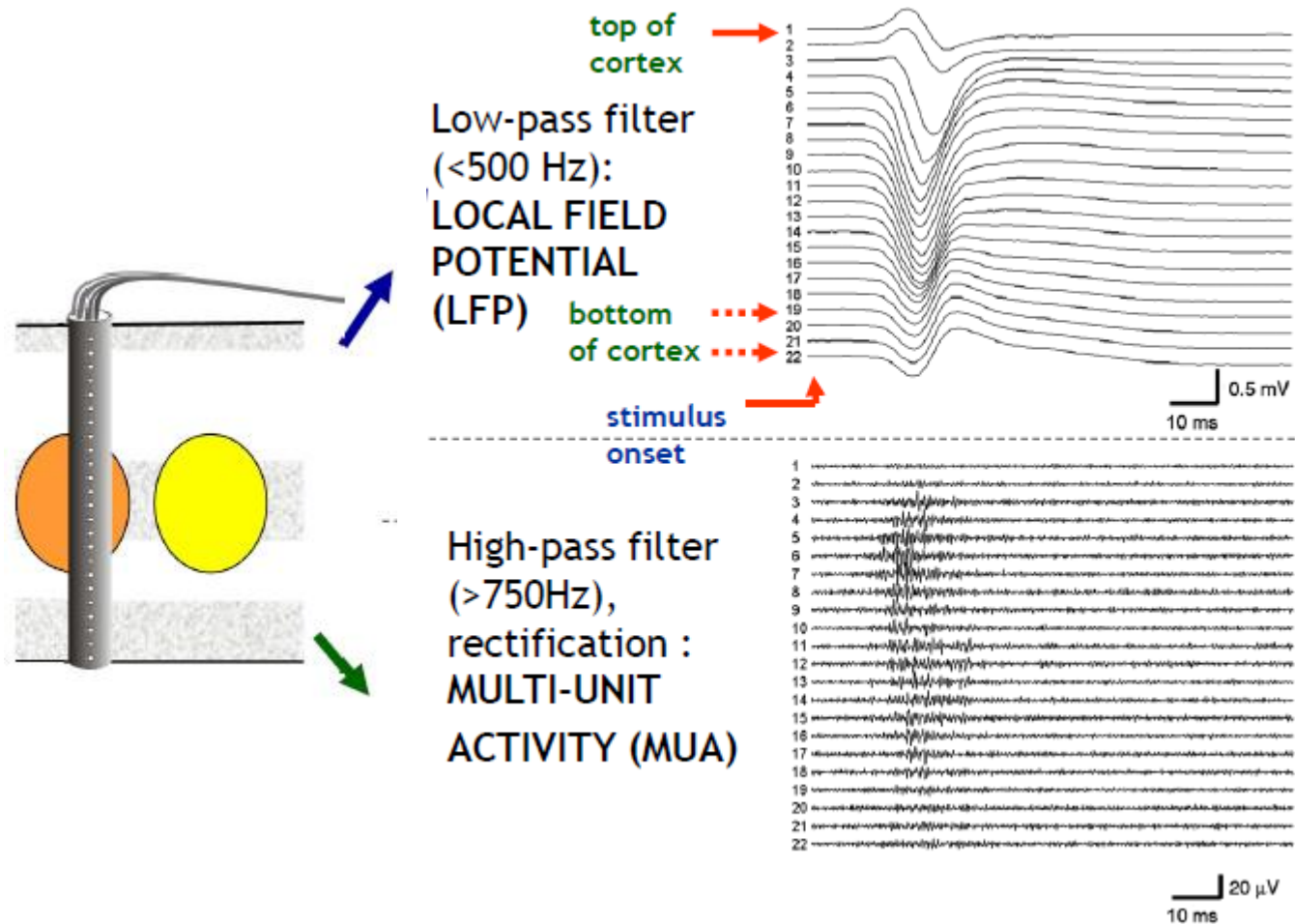
# Data analysis of neural activity

Recorded signal split into two frequency bands:

- High-frequency band ( $> \sim 500$  Hz): Multi-unit activity (MUA), measures spikes in neurons surrounding electrode tip
- Low-frequency band ( $< \sim 300$  Hz): Local field potential (LFP), measures subthreshold activity
- LFP sometimes used for current-source density (CSD) analysis with laminar-electrode recordings spanning cortical layers



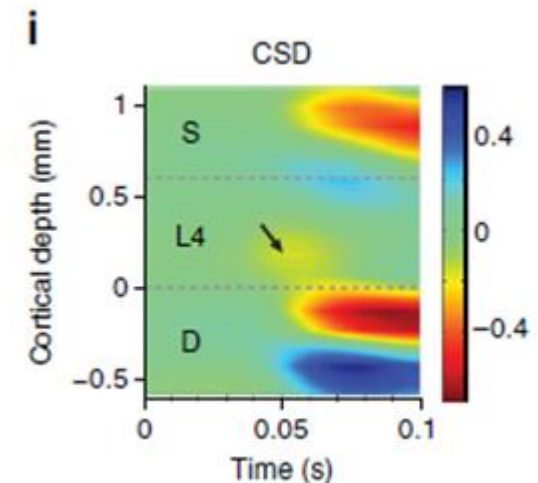
# Laminar electrode recordings



# Current source density (CSD)

Current source density (CSD): density of current leaving (**sink**) or entering (**source**) extracellular medium in a volume.

When net positive current enters the cell we speak of current sink and it corresponds to **negative** CSD. When net negative current enters the cell we speak of current source and it corresponds to **positive** CSD. Since negative CSD is observed for **excitatory synaptic stimulation** (positive current entering the cell/negative CSD), many researchers prefer to denote current **sinks** by **red** (“hot spot”) and current **sources** by **blue**.



# Discussion

