Medial Temporal Lobe and Long-Term Memory

Structures damaged in Korsokoff’s

The Medial Temporal Lobe

The Hippocampus

H.M.

- Suffered from severe epilepsy
  - Hippocampus (and Medial Temporal Lobe) are often source of epileptic disorder
- Went through surgery for removal of hippocampus and several neighboring structures
H.M.

- Suffered from severe epilepsy
  Hippocampus (and Medial Temporal Lobe) are often source of epileptic disorder
- Went through surgery for removal of hippocampus and several neighboring structures
  - The surgery helped his epilepsy, but…
  - H.M. suffered from severe anterograde amnesia

Anterograde amnesia (cannot form new memories)
Limited retrograde amnesia (~2 years prior to surgery; older memories preserved)

What does that tell us about hippocampal function?

Some memory tasks H.M. is good at….
Medial Temporal Lobe and Epilepsy

- epileptogenic focus (shown in red)
  - the region where the electrical seizure originates

    narrow epileptogenic area    wide-spread epileptogenic area

Anatomical areas of **implicit memory**

- Basal ganglia
- Thalamus
- Cortex

Anatomical areas of **explicit memory**

- Basal ganglia
- Thalamus
- Cortex

**Long-Term Potentiation (LTP)**

- Presynaptic neuron
- Postsynaptic neuron

- Presynaptic membrane
- Postsynaptic membrane

- Postsynaptic potential (mV)
- Time

- Control
- Temporal stimulation

- Control: Presynaptic membrane potential (mV)
- Temporal stimulation: Postsynaptic membrane potential (mV)

- Time

- Postsynaptic membrane potential (mV)
- Time
Hebb’s Rule

- proposed in 1949 by the psychologist Donald Hebb
  "When an axon of cell A... excites[a] cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells so that A’s efficiency as one of the cells firing B is increased."
- simultaneous firing is important
- places emphasis on the conditional probability and the history of the two cells