Reminder

• Class is canceled Tuesday 9/20

Which word would they point to?

Face
Fruit

Which word would they point to?

Face
Fruit

Toad + Stool
Some methods for localizing brain function

- Lesions
  - E.g., severed corpus callosum
  - Inference: the damaged tissue supported the impaired function
  - Are these experiments?
    - No; there’s no manipulation

• Transcranial magnetic stimulation (TMS)
  - Creates temporary (!) lesions
  - Allows experimental designs

• Functional magnetic resonance imaging (fMRI)
  - Measures blood flow, which increases to tissue where neurons are firing faster
  - Inferences about function depend on subtractive method

Subtractive method

Evidence that looking at the stimulus activates posterior cortical areas
Good internal validity requires careful design of control conditions

The neuron

Structure: Dendrites, Soma, Axon
Function: Inputs, Computation, Output

Polarization: Imbalance of electrical charges across cell membrane
Computation: Am I depolarized?
If so, then “fire”: Propagate depolarization down axon
This propagation is an action potential (“spike”)
Action potential

Each spike travels at constant speed
The firing rate (# spikes/second) determines signal strength
Traffic analogy: strong signal = same speed, lots of cars

Synapses

Synapse: Small gap between axon terminal and dendrite
Bridged by neurotransmitters released when a spike arrives
Some neurotransmitters add +’s, some add -’s

Excitatory synapses add +’s to the soma

Inhibitory synapses add -’s to the soma

Signal strength

Signal strength

Sensation

• Sensation begins with transduction:
  – Light/sound/pressure to neural signals
  – Vision: Photoreceptor cells (rods, cones)
• Ends with perception of objects
  – Somewhere in the cortex
  – Many stages in between
Which ganglion cell(s) are firing at baseline?
- B and D

Which ganglion cell(s) are firing above baseline?
- A

Which ganglion cell(s) are firing below baseline?
- C

Ganglion cells project topographically to primary visual cortex
The visual cortex detects rows of cells firing above or below baseline
- So detects edges in the world
- Edges help define objects

The Hermann grid
The Hermann grid

Ganglion cells at intersections send weaker signals than their neighbors. The brain interprets the weaker signal as less light hitting the "+" region.

Why do the spots go away when you foveate them? The fovea has higher visual acuity (ganglions there have smaller receptive fields).