

NEUROSCIENCE:

- **A brain is divided into the:**
 - **Frontal lobe:**
 - **Broca's Area:** The part of the brain that controls language.
 - Only the left Broca's area does language.
 - The executive function of decision-making.
 - Humans have such a huge frontal lobe compared to other mammals because humans do a lot of planning and thinking.
 - **Parietal lobe:** Specializes in attention.
 - **Occipital lobe:** Specializes in vision.
 - One-quarter of the human brain is devoted to vision.
 - If your visual cortex is damaged even if your eyes are fine, you will still be blind.
 - **Temporal lobe:** Specializes in the audition
 - **Corpus Callosum:** Connects the right and left hemispheres of the brain.
 - The sensory and motor strip is referred to as the sensory and motor homunculus.
- The outer part of the brain is called the **cortex ("rind")**.
- Anything in the **cortex** is doing higher thought processes.
- Any thought process takes place in the **cortex**.
- For each spot of your skin, the brain spot for each of the following is bigger if it is more sensitive.
- If you have more precise sensitivity, like your fingers, will give you big hands, but a small rest of your limbs.
- **Localize of function:**
 - Different parts of the brain do different things.
 - **First famous example: Broca's area (1860):**
 - Broca's patients with left hemisphere damage at a particular place lost the power of speech.

- First clear evidence that “higher thought” was localized in the cortex.
- Many other examples are always being discovered.
- Moral reasoning was localized a higher thought of the brain.
- **Split-Brain Patient:**
 - The left hemispheres see the **RIGHT** visual hemifield and control the **RIGHT** arm.
 - The right hemisphere sees the **LEFT** visual hemifield and controls the **LEFT** arm.

THE LIMITS OF LOCALIZATION OF FUNCTION:

- How specifically does localization of function get?
- Do individual neurons have specific functions?
- The case of the Jennifer Aniston cell.
- People would cut open the brain and remove cells that cause them to have seizures.
- While patients, waited in the hospital with wires hooked up to their brains, science would also perform other tests on them.
- They would show pictures of celebrities and if one of the cells got excited.
- Scientists would get more pictures of the same celebrity and more cells would fire.

NEUROSCIENCE METHODS:

- **Individual cellular recording:**
 - Electronic probes of individual neurons.
 - Very sensitive, but also very invasive (very damaging to the brain).
 - Historically mostly in animals... now in humans too.
- **Electroencephalography (EEG):**
 - An array of electrical probes on the scalp.
 - Characteristic results: Event-related potentials (ERP).
 - High temporal precision, but low spatial precision.

- **Lesion studies:**
 - Strokes
 - Surgeries
 - Bullets
 - CO poisoning
 - Study what cognitive deficits are associated with what injuries.
- **Neuroimaging (PET, fMRI):**
 - Positron Emission Tomography (PET)
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 - Functional Magnetic Resonance Imaging)
 - **Methods for visualizing blood flow in the brain:**
 - BOLD (Blood Oxygen Level Dependent) signal.
 - Which is assumed to correlate to neural activity, over a slow time scale (> 10 seconds).
 - Requires some sort of comparison such as Method of Subtraction.
- **Example:**
 - **Statistical Pattern Learning:**
 - Researchers taught subjects statistical patterns among visual items (letters in an unfamiliar alphabet).
 - In the test phase, subjects were shown either (a) visual examples that obeyed the pattern or (b) random examples.
 - They then plotted those brain areas in which activity during (a) was greater than activity in (b).
 - Ex: a “map” of BOLD(a) - BOLD(b).
 - Areas of greater activity in (a) include the Superior Frontal Gyrus (SFG).