Brain & Behavior 1 & 2: Einstein's brain

I. What Makes Us Smart?

A. Einstein's brain: Used to answer this question. No straightforward answer, though. Einstein's brain showed some differences in one region, but not much else. Although "gross" neuroanatomy differs little, it depends on where you look.

B. Three major divisions of the brain: There are three main divisions, but it's the last of these, the forebrain, that sets higher mammals apart from other animals. It's also what probably made Einstein different.

Three major divisions of the brain. These are very coarse structures, and each one of them is composed of many parts.

1. The hindbrain: This is the lowest set of structures in the brain. Think of this as your reptilian brain because many of the structures do the same thing in humans that they do in reptiles.

2. The midbrain: Next up the hierarchy of the brain is the midbrain region. This is our bird and amphibian brain because it's similar in humans and amphibians.

3. The forebrain: Finally, we have the forebrain. This is a huge region of brain that includes the cerebral cortex, plus several subcortical areas. (Subcortical means "below the cortex." These are structures that are below the gray matter of the cortex.)

II. A Few Parts of Forebrain

A. Basal Ganglia: Important for movement (this is the region that has depleted dopamine in Parkinson's disease)

B. Limbic System: A set of structures important for emotion as well as learning and memory

C. Cerebral Cortex: Why is the cortex wrinkled? Lobes; occipital, parietal, temporal, frontal

III. Neuropsychology of Cortex

We'll investigate the psychological functions supported by each of the lobes. The idea here is that psychological behaviors can be localized—pinpointed to—different regions of the cortex. (But, we shouldn't oversimplify localization of function. Complex behaviors require many areas working together.)

IV. How Cortex Works

In understanding what makes us smart, we also need to look beyond large brain regions ("gross anatomy"). We need to consider how those little neurons are wired—how they're connected with one another.

One consequence of wiring is that maps are created in the brain for different systems. We'll talk about touch and the *somatosensory homunculus*. There are two key points to this homunculus: 1. Adjacent points on the skin surface remain adjacent in cortex and 2. Some regions of the skin surface have more cortex devoted to them (e.g., hands, lips).

One thing we see with cortex is that it is plastic (i.e., malleable). In touch, we see this in the changes in the homunculus following amputation. But, this plasticity has some limitations, as is evident in phantom limb pain and the phantom limb syndrome that can follow amputation of a limb.

Terms used in this lecture

hippocampus
amygdala
cerebral cortex/cerebral hemispheres
occipital lobe
parietal lobe
temporal lobe
frontal lobe
agnosia: impairment in object recognition
aphasia: impairment in language
amnesia: impairment in memory
Phineas Gage (the name of a person we'll talk about)
Somatosensory homunculus