Your High-Tech Brain

Follow the 8 Sensory Inputs

Red Circuits are inhibitory, all other colors are excitatory

86+ Billion Neurons

15+ Billion Neurons in the Cerebral Cortex

65+ Trillion Connections in the Cerebral Cortex

Avg of 1,000-10,000 Connections (Synapses) per Neuron

(Transistor equivalent of 45,000 i7 Dual Core Processors since synapses work like transistor switches)

The Cortex is a 6 layer folded circuit board filled with electronics

1 mm^3 of cortex contains 50,000+ Neurons making over 100 Million Synapses (switches) } 1 mm^3

(Apple A8 processor (iPhone 6) has about 23 Million transistors (switches) per mm^3)

*est. processing power of over five A8 processors in this little box**

The Total Surface area of the Cerebral Cortex = 2,500 cm^2

"Three frontal circuits have been associated with decision making: 1) the OFC 2) the DLPFC, and 3) the ACC, important in sorting among conflicting options, as well as outcome-processing." *- The Functional Neuroanatomy of Decision-Making*

"It can now be recognized that the region (Orbital and Medial Prefrontal Cortex) as a whole receives highly processed **sensory** afferents, provides for cortical influence over visceral functions, and participates in high-level cognitive and emotional processes." *-The Organization of Networks within the Orbital and Medial Prefrontal Cortex of Rats, Monkeys and Humans.*

"Religious conviction acts like an anxiolytic, reducing emotional reactions to errors or uncertainty, providing people with a meaningful system helping them to understand the complex and uncertain world that we live in. In physiological terms, it reduces ACC activity and consequently distress." *-The Anterior Cingulate Cortex*

Visual Processing in the Retina

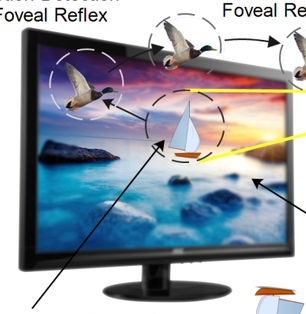
125 Million Rods & 6 Million Color Cone Photoreceptors to 1 Million axons in the Optic Nerve

compresses video, detects movement, accident avoidance system scans for objects on a collision path and automatically sends reflex control to limbs.

estimated processing power of over four Apple A8 processors per eye

Motion Detection Foveal Reflex

Smooth Pursuit Foveal Reflex



Peripheral Low Resolution View

Fovea High Resolution View

200,000 Cones in Fovea

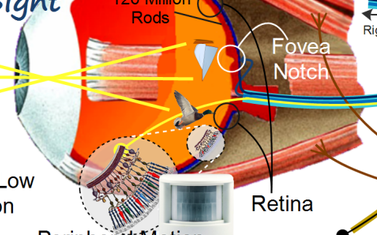
Fovea Notch Diameter is 1.5 mm

Retina Thickness is .12 mm, area is 2,500 mm^2

The retina does not simply send a picture to the brain. The retina spatially encodes (compresses) the image to fit the limited capacity of the optic nerve. *-Wikipedia*

"It is now clear that even fairly innocuous-looking experiences can profoundly affect brain development and that the range of experiences that can alter brain development is much larger than had once been believed" *-Experience and the developing prefrontal cortex*

1. Sight



Peripheral Motion Sensing Circuitry provides visual reflexes

imaged flipped upside down and backwards

2. Smell

12 Million Olfactory Receptor Cells (Human)

1 Billion Olfactory Receptor Cells (Dog)

5 Billion Olfactory Receptor Cells (Hound)

8. Facial Expressions

Automatically Produced and Read

The six main expressions are happiness, sadness, surprise, fear, anger and disgust

"The human face is an engineering marvel. Underneath our skin, a large number of muscles allow us to produce many configurations." *-A Model of the Perception of Facial Expressions of Emotion by Humans*

3. Taste

5-10 Receptors per Taste Bud

9,000 Taste Buds

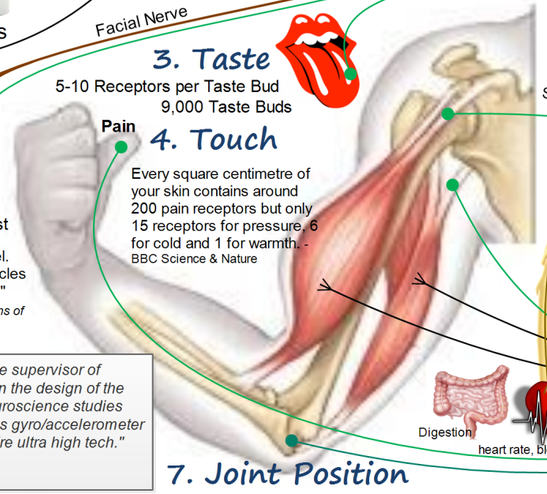
4. Touch

Every square centimetre of your skin contains around 200 pain receptors but only 15 receptors for pressure, 6 for cold and 1 for warmth. - BBC Science & Nature

7. Joint Position

Vagus Nerve

Activation of the vagus nerve typically leads to a reduction in heart rate, blood pressure, or both. *-Wikipedia*



Research performed by an Aerospace Engineerer (BA Mechanical Engineering, Villanova 84), The supervisor of Computer Aided Design (CAD) for a top military guidance and navigation company who worked on the design of the Space Shuttle guidance system and later became a statistics software developer. Over 1,000 Neuroscience studies were analyzed over a 4 year period and a large schematic assembled. His comments, "The 3 axis gyro/accelerometer triad sensor we put in the Space Shuttle and all missile guidance systems is behind your ear. We're ultra high tech."

The Visual Processing System

4-6 Billion Neurons

"There is overwhelming evidence that areas in the IPS are involved in complex hand use, reaching, grasping, matching visual and body centered frames of references for reaching and grasping, and programming intentional hand movements." -Topographic Maps within Brodmann's Area 5 of Macaque Monkeys

"The recognition process likely entails a sequence of computations across visual cortex, starting from local computations in early visual cortex related to low-level properties of the visual stimulus, such as disparity, motion, or orientation, conveying little sense of the global object shape, then proceeding to more global computations in higher levels of the hierarchy of visual processing."

- Representation of Shapes, Edges, and Surfaces Across Multiple Cues in the Human Visual Cortex

"Evidence from functional neuroimaging indicates that visual perception of human faces and bodies is carried out by distributed networks of face and body-sensitive areas in the occipito-temporal cortex." *-Different Cortical Dynamics in Face and Body Perception*

"Our results thus confirm that nudity of human bodies is detected early on during visual processing, and that the human brain exhibits enhanced visual processing to other people's nude bodies. Interestingly, the N170 response to nude bodies was even greater than that to faces." *-The Naked Truth: The Face and Body Sensitive N170 Response Is Enhanced for Nude Bodies*

"During head movements, both systems must interact with the vestibular system. The goal of the pursuit system is to keep the retinal target image on the fovea by matching the eye velocity to target velocity." -The vestibular-related frontal cortex and its role in smooth-pursuit

"It is now becoming increasingly apparent that even single neurons can perform complex computations." *-Wikipedia*

"Researchers have discovered a sophisticated neural computer, buried deep in the cerebellum, that performs inertial navigation calculations to figure out a person's movement through space." *-Brain's Inertial Navigation System Pinpointed*

Vestibule is similar to the main sensor used in Military Guidance and the Space Shuttle

"A complex interneuronal circuitry must exist to coordinate the control of limb extensor and flexor activity across multiple joints bilaterally. Indeed, interneurons make up as much as 97% of all cells in the cord." -Spinal cord

The longest axon of a human motor neuron can be over a meter long. *-Wikipedia*

Learned images become etched in memory, then recognized and forwarded to the OFC

DNA storage is very dense. At theoretical maximum, DNA can encode 455 Billion Gigabytes per gram *-Next-Generation Digital Information Storage in DNA*, Harvard University