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

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

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

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

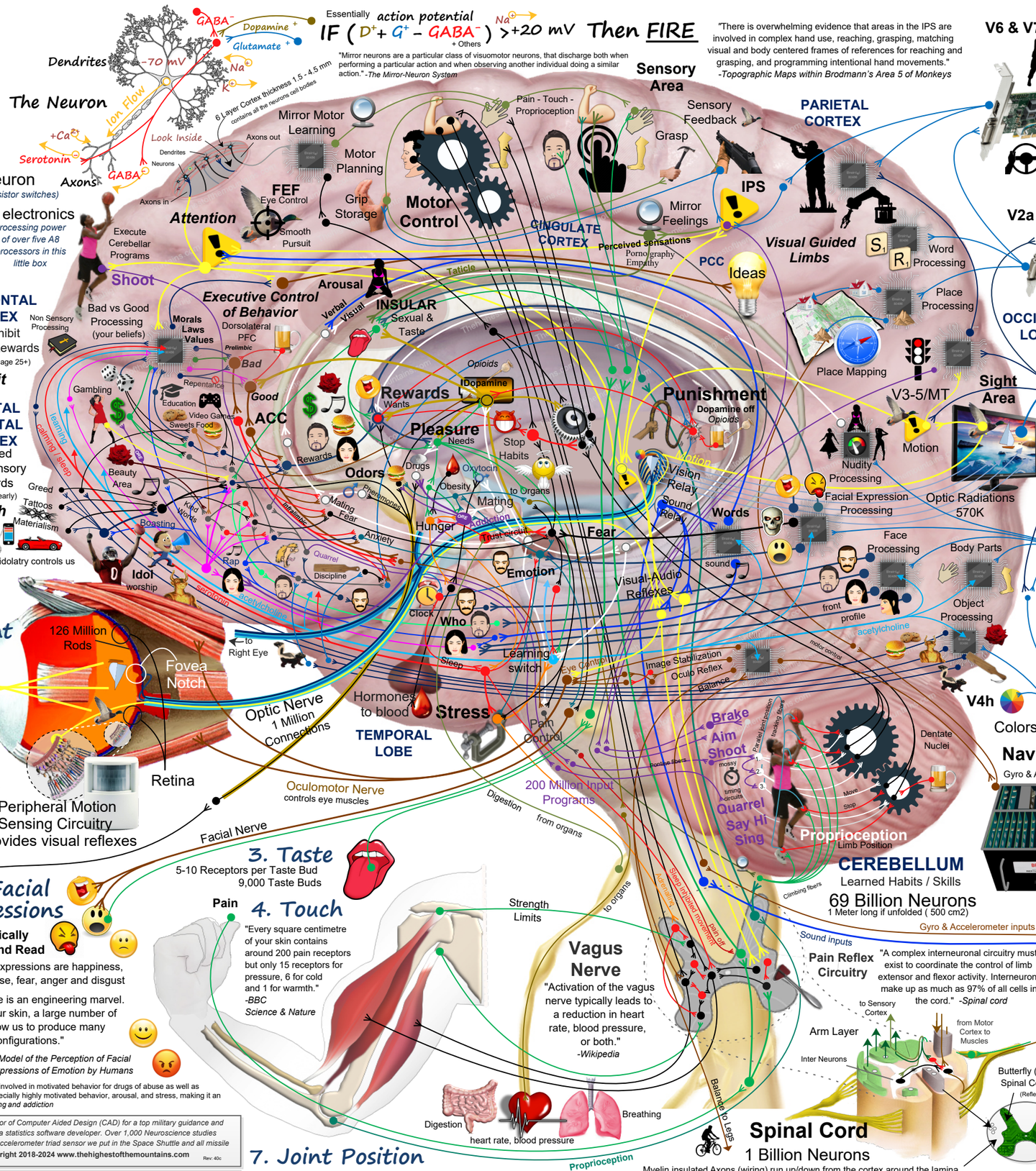
"It can now be recognized that the region (Orbital and Medial Prefrontal Cortex) as a whole receives highly processed sensory afferents, provides for cortical influence over visceral functions, and participates in high-level cognitive and emotional processes." *-The Organization of Networks within the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



"Mirror neurons are a particular class of visuomotor neurons, that discharge both when performing a particular action and when observing another individual doing a similar action." *-The Mirror-Neuron System*

"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 Monkeys

The Visual Processing System

4-6 Billion Neurons

"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. 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*

"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*

Rev 40c

Addiction/Arousal System

ORE

"Recent studies have shown that orexin (ORE) cells located specifically in lateral hypothalamus (LH) are involved in motivated behavior for drugs of abuse as well as natural rewards. The involvement of the orexin system in brain mechanisms that regulate motivation, especially highly motivated behavior, arousal, and stress, making it an ideal target for studying addiction and discovering treatments." *-Role of orexin/hypocretin in reward-seeking and addiction*

Research performed by an Aerospace Engineerer (BA Mechanical Engineering, Villanova), 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." *-Aidon Joseph*

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