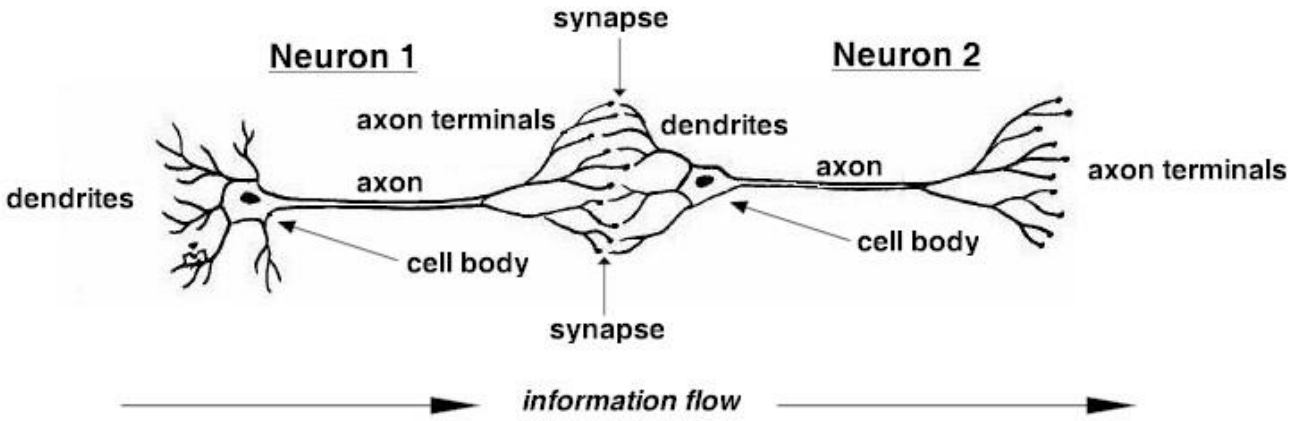
My Big Bang Moment

The 7th week marks the creation of the first neurons and being familiar with what they do is essential for understanding how you think and how you behave. Neurons are the fundamental cells of the brain and nervous system. They are what link the brain to outside world. Neurons deliver information from sensory organs to the brain and the brain interprets it and creates the "*irrefutable realities*" through which we view our world and give meanings to what we see.



The information sent from sensory organs to the brain is "electrochemical" information.

1. It originates in the sensory organs – eyes, ears, nose, tongue and skin – and enters the neurons attached to them through their dendrites.

2. Information travels from dendrites to the cell body where information from other dendrites is also entering.

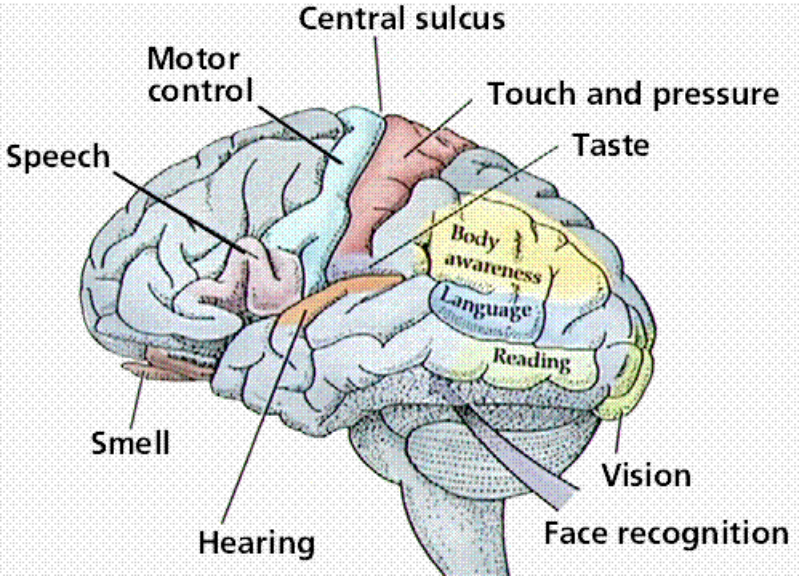
3. Information flows out of the cell body down the axon to axon terminals.

4. Neurons do not connect to each other. A gap exists between axon terminals of the first neuron and dendrites of the second neuron. The gap is called a synapse.

5. Axon terminals produce neurotransmitters (chemicals) and they float across the gap to the dendrites of the next neuron.

6. The neurotransmitters carry information across the gap, a process called "firing." Neurons that "*fire together*" are said to "wire together" so they can reliably "*re-fire together again*" in the future.

All of the sensory information ultimately flows into specific parts of the brain that process specific sensory organ information.

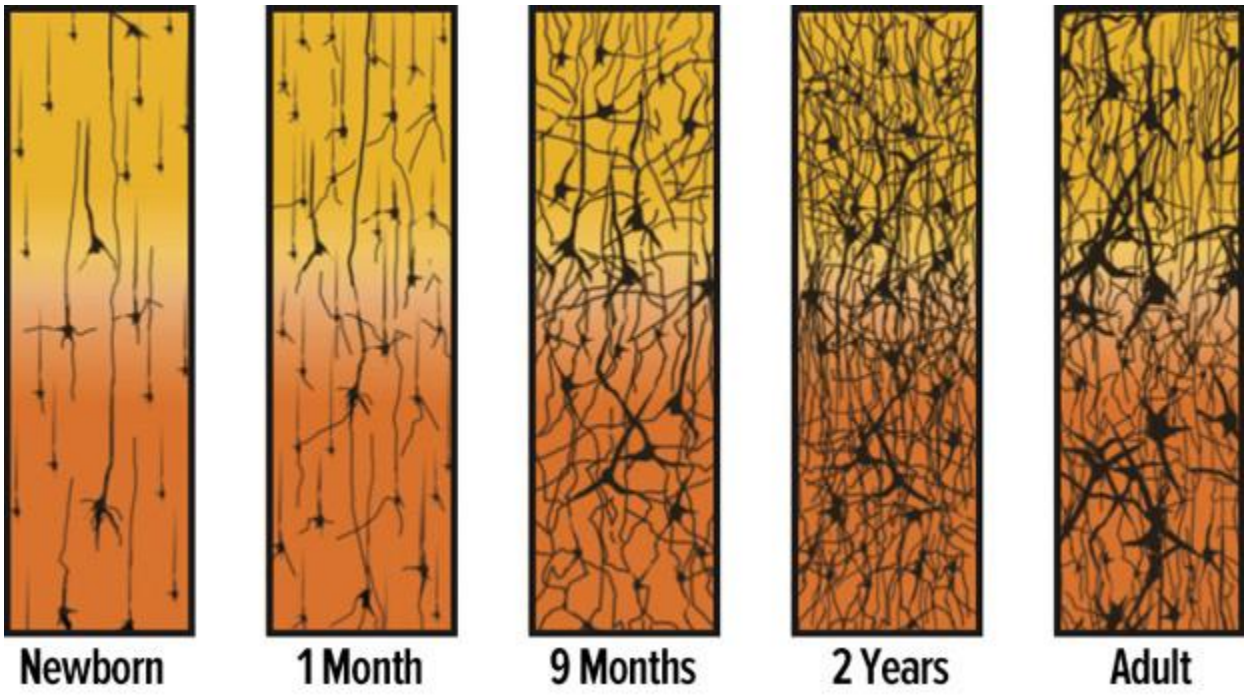


In order to understand the complexity of this process, let's use a birthday party as an example. Think about all of the sensory information being sent to neurons simultaneously as you participate in the party – your eyes are taking in everything going on around you, your ears are hearing different voices and sounds, your nose is smelling foods and drinks, your tongue is anticipating the taste of cake and ice cream and people are touching and hugging you. If you could take a snapshot of all those neurons firing in your brain, it would look something like this (multiplied by a million times):

A complete picture of all the neural firings at the birthday party would like constellations in night sky.

The constellations of neural firings generated by the birthday party experience are "**our memories of the birthday party**." In order for us to remember particular things about the birthday party, our brain must "**re-fire the same neural constellations**" that fired in the original experience.

The complexity of the physical environment in which memories are stored is monumental. The brain's cortex contains about 20 billion **neurons** and each one has up to 15,000 dendrites and axon terminals, which makes it possible for hundreds of trillions **synaptic connections** to be created. The number of neurons in an adult human brain is about the same number of stars in the Milky Way galaxy and the number of synaptic connections in an adult brain is equivalent to the number of seconds in 30 million years. There is only one creature with more synaptic connections than an adult human – *it is a two year baby and it has twice as many*.



We saw that seven weeks after conception the first neurons began forming. They were even more spread out and unlinked than those in the graphic of a newborn brain. The first neural constellations were created in the 15th week when the eyes sent information generated when the eyes saw light that filters in from outside the mother's body. This was followed in the 20th week as the ears became aware of noises. In the 25th week the brain began recognizing familiar sounds, including the sound of its mother's voice. By the 28th week billions of neurons were developing in the brain.

Just before the birth process began the brain weighed about 400 grams and already contained the memories listed above. Now think about the tsunami of sensory information generated the moment the journey through the birth canal began. Pressure was being felt all over the body, bright lights were blinding the eyes, all sorts of sharp strange were coming from everywhere -- and a slap on the butt caused all sensory systems to boot up and come online! What was that experience like to a newborn? The closest example we can think of is the big bang that created the universe.