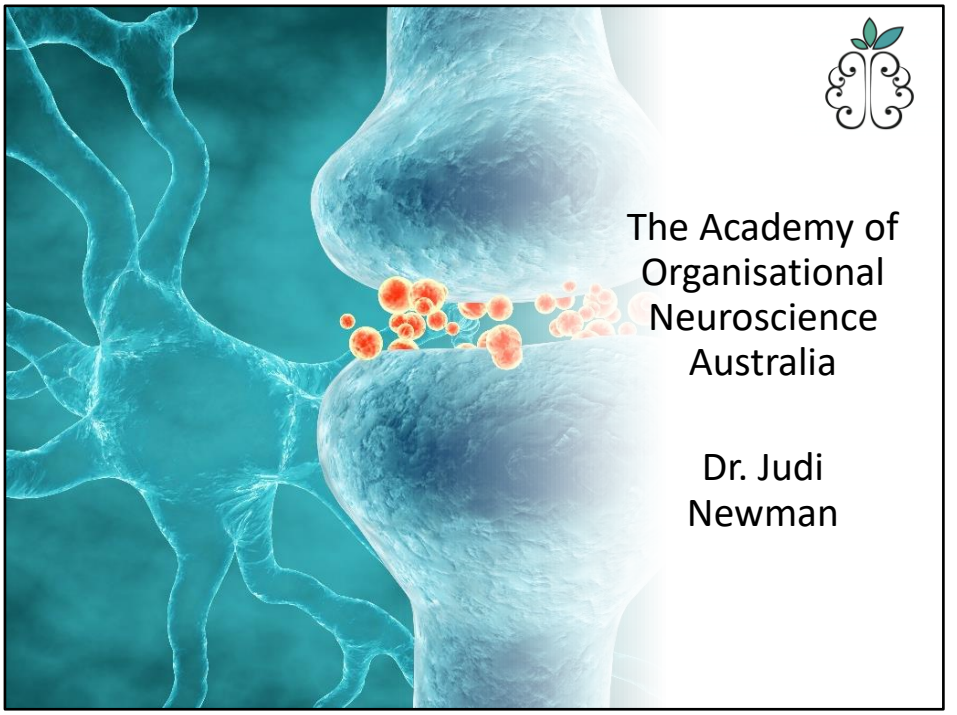
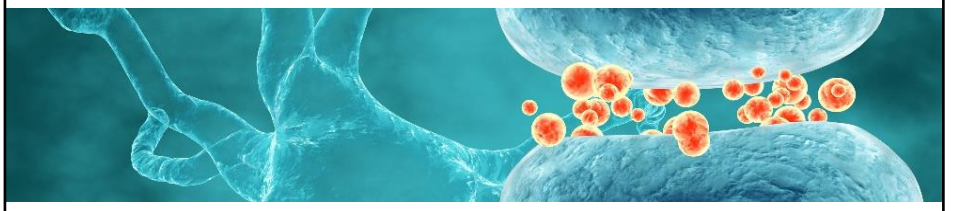


Welcome, I am Dr. Judi Newman coming to you from the Academy of Organisational Neuroscience and our tutorial is on The Neuron. When we think, learn or remember thousands of neurons fire. This tutorial will name the neuron parts, teach the terms and explain what happens when a neuron fires.

Tutorial

The Neuron



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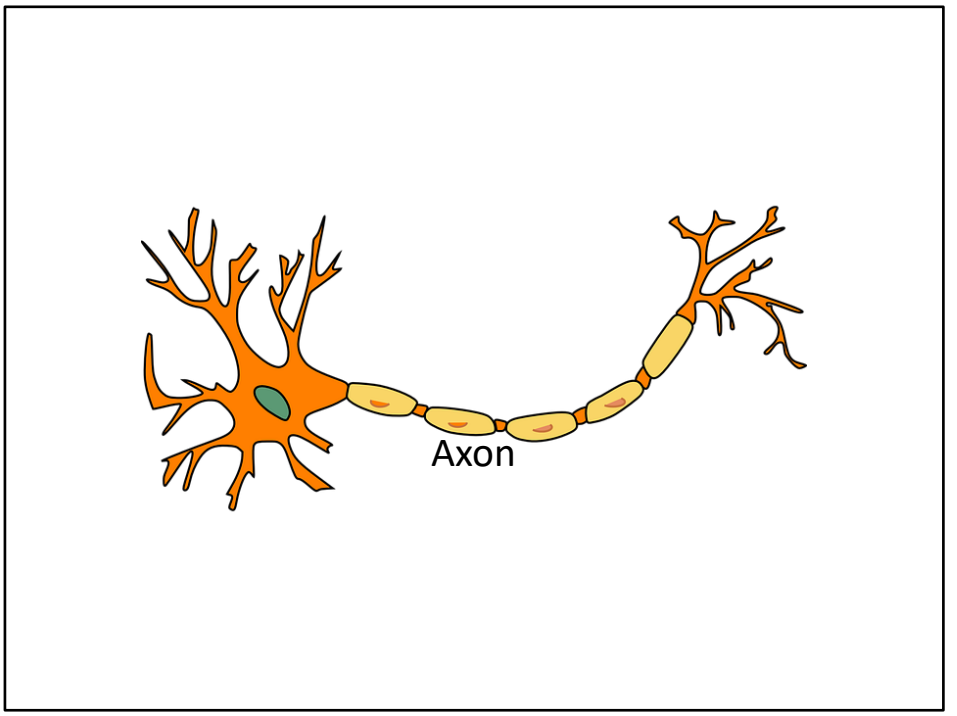
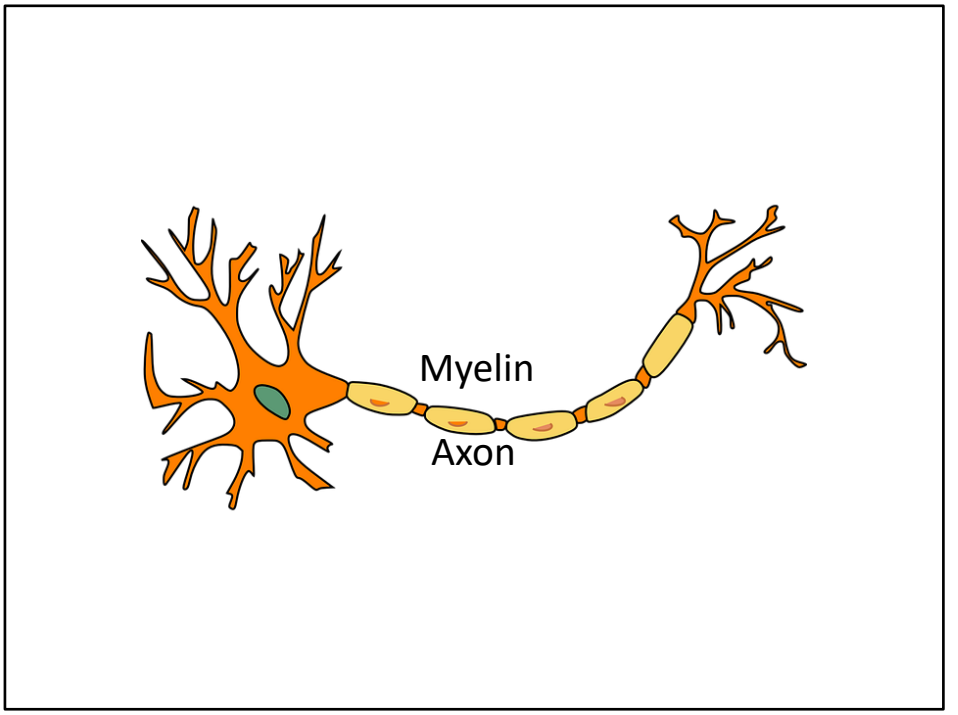
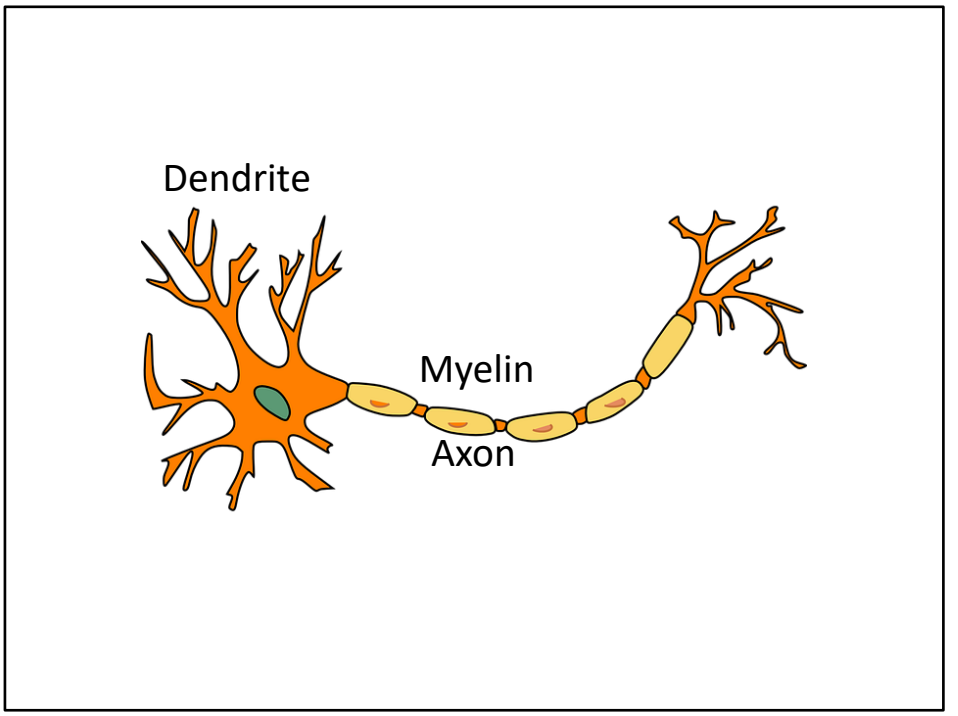
A neuron is a nerve cell and we have around 80 billion **neurons** in our brain. There are three types, a sensory neuron, an inter neuron and motor neuron.



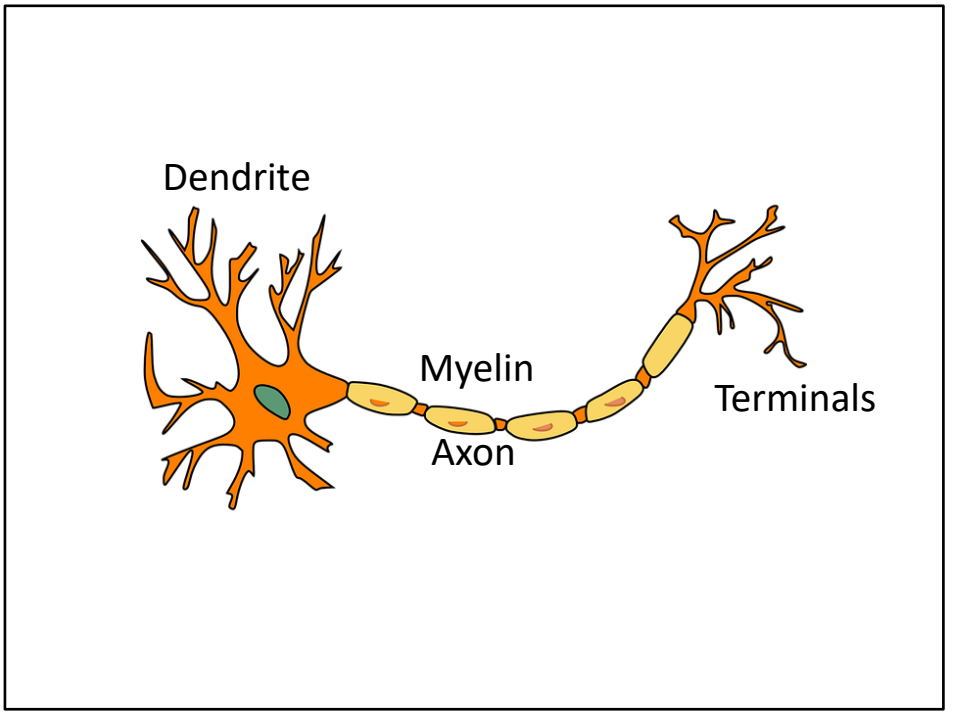
The different neurons have different shapes but they all have the same parts. The **axon** is the shaft of the neuron.



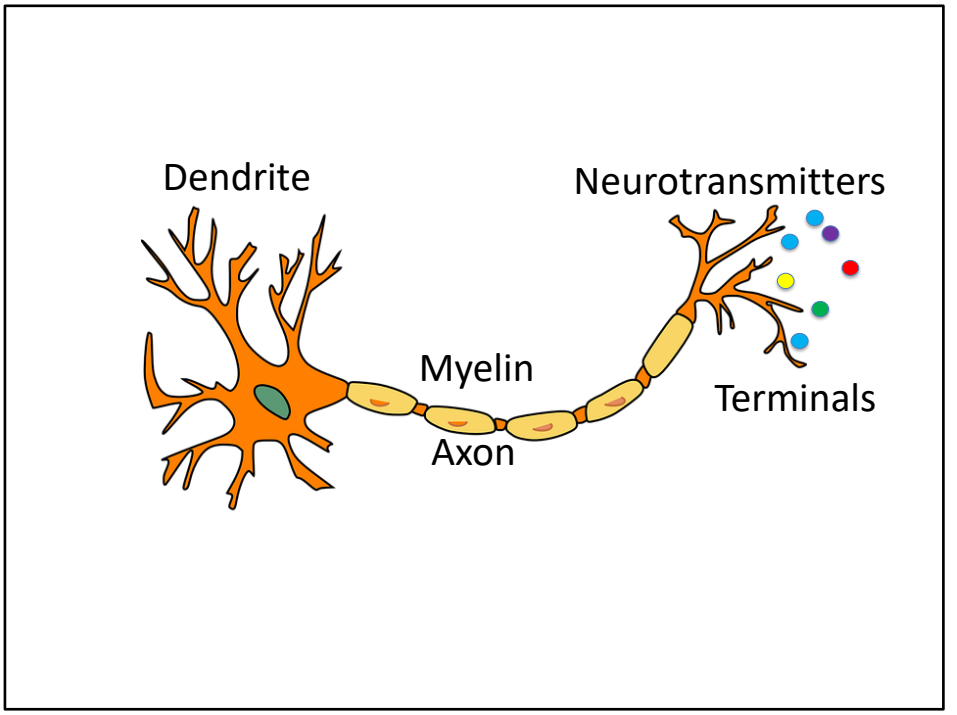
The **myelin** is the coating that insulates the axon and it is called the white matter. Myelin is only ever found on the axon and the thicker it is, the faster your thinking.



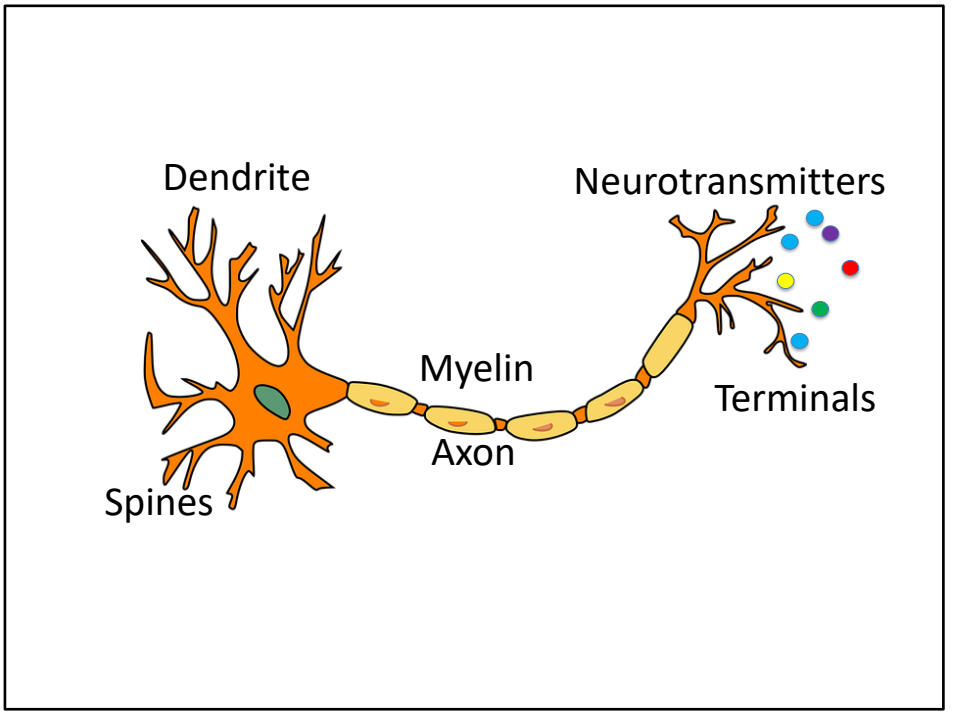
The **dendrites** are branches are shown here on the left. Each neuron has a left and right side. Dendrites grow and branch in response to our environment and the more dendrites a neuron has the more information it can collect and process. This process of the brain networks changing in response to the environment is called **neuroplasticity**.



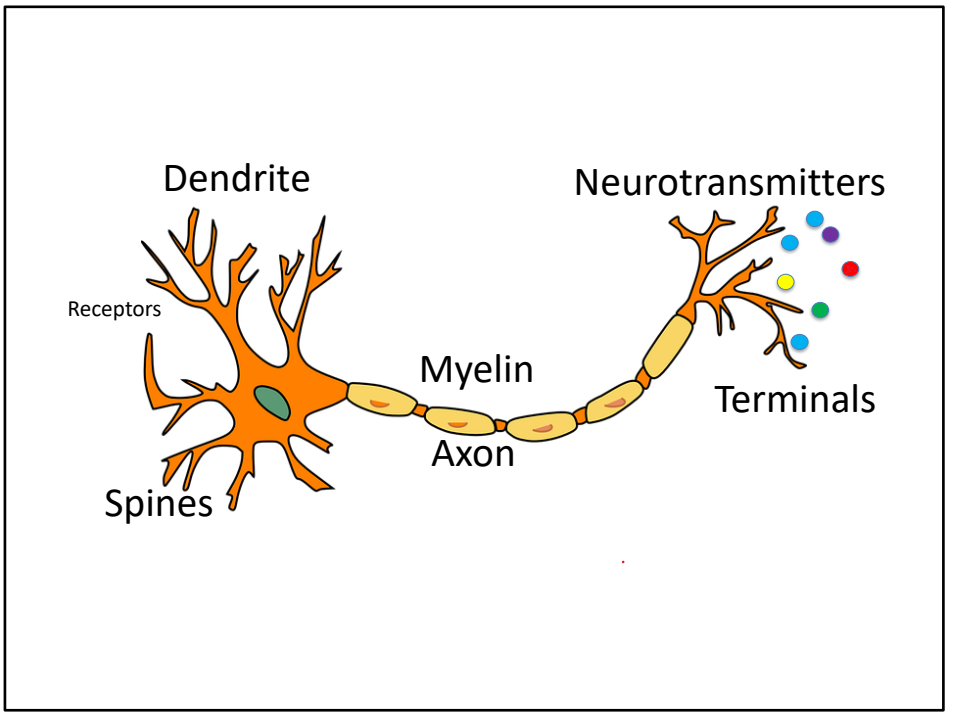
At the other end of the neuron are the **terminals**. The terminals house the **vesicles** that hold the brain chemicals.



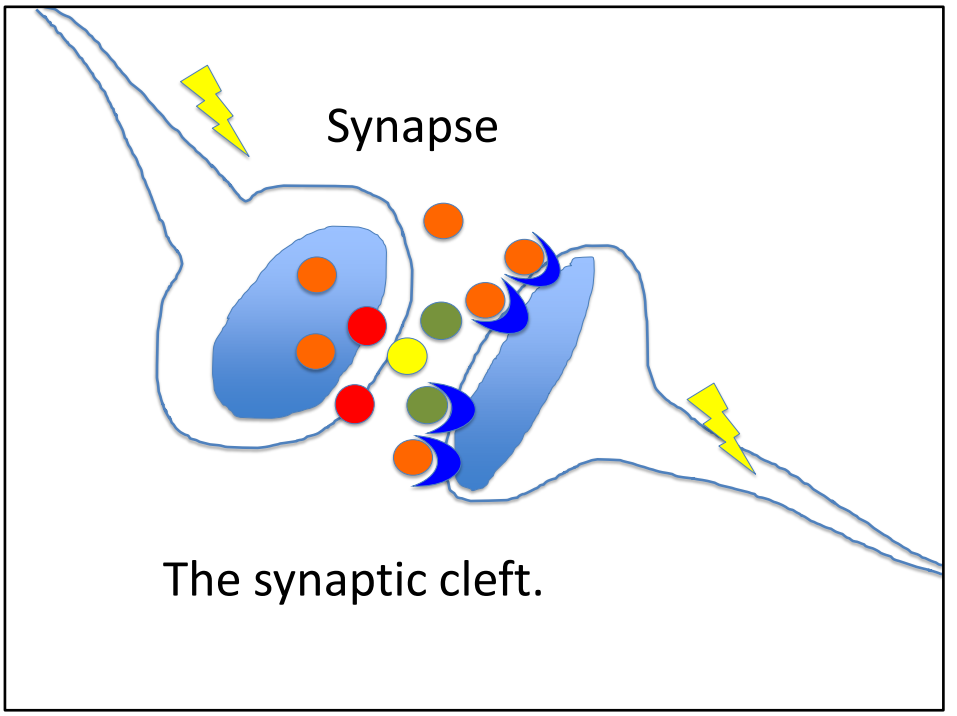
The brain chemicals are represented here by the little dots and are called **neurotransmitters.** Each neurotransmitter only has 2 or 3 roles. They can either inhibit or excite a neuron to fire.



When we undertake effortful learning, the dendrites grow modules that are called **spines**. The spines increase the surface area of the dendrites in order to take in more information. The more spines and dendrites we have the more we can learn and recall is faster.



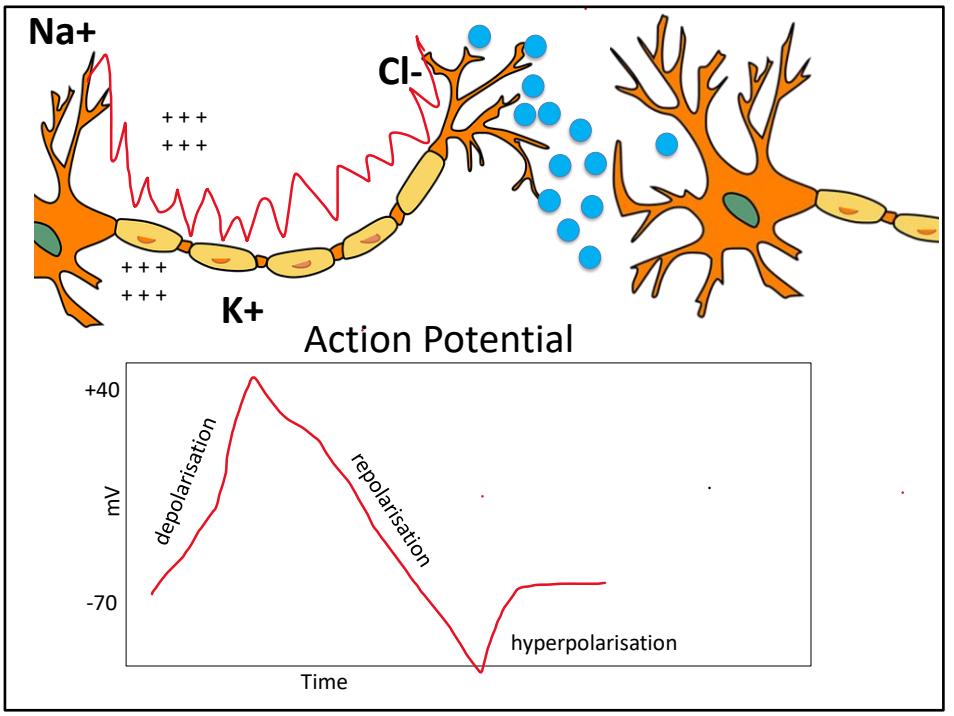
At the end of the spines and dendrites there are **receptors**. They act like docking stations to collect the neurotransmitters from the next neuron.



The whole connection between the pre synaptic neuron and the post synaptic neuron is called the **synapse** and the plural of synapse is called the **synapsis.** No two neurons meet which means there is a gap between each neuron. The gap is called the **synaptic cleft.** The electric message that moves along the neuron shaft needs to transform into a chemical message to move across the gap to reach the next neuron.

NAME	WHAT IS IT?
Neurotransmitters	Brain chemicals
Soma	Centre of cell (DNA)
Myelin	Coating on the axon
Dendrite	Branches on left
Synapse	Connection
Axon	Shaft of neuron
Receptors	Docking stations
Terminals	Neuron end on right
Spines	Growth on the dendrite

Every time we recall we relearn. So to summarise, ….



Now for a deep dive into our thinking at neural level. When a neuron fires it is said to have an **action potential**. If there are enough neurotransmitters to excite the neuron the neuron will fire. We can illustrate this chemical and electrical reaction by the above graph. The Y axis represents milli volts and the X axis represents milliseconds. When a neuron is not firing it is said to be at resting potential. The inside of the neuron at resting potential has a negative charge and outside the cell wall is a positive charge. As a neuron fires the process of **depolarisation** takes place. The resting potential of a neuron is -70 millivolts and starts to depolarise when sodium ions which have a positive charge, move through the cell wall, changing the conditions of the neuron cell from negative to positive in that local area. At about -55 millivolts, the process meets a threshold and depolarisation continues until the charge builds

to +40 mV when the neuron fires. It has been said that the brain contains enough charge to light a very tiny light bulb. After the neuron fires the cell starts to **repolarise** change charge conditions, stimulating gates in the cell wall to open and close allowing potassium ions, which have a positive charge to flow out of the cell, creating conditions for the electrical message to be passed in and out of gates along the axon. After an action potential a neuron usually over shoots, which is called **hyperpolarisation** and it settles back to **resting state**. For a few seconds, the neuron cannot fire. When the electrical message hits the myelin coating it moves faster as it does not have to travel through the gates thus making thinking faster. When the electrical message reaches the neuron terminals and certain conditions are met, chloride ions which have a negative charge move out of the cell, triggering the vesicles to release the neurotransmitters. The neurotransmitters float across the synaptic cleft and dock into its matching receptor on the next neuron. Receptors only have one role such as, the flavour of a pear or a feeling of disappointment. If enough neurotransmitters excite the post synaptic neuron the whole process continues down the axon.