



Plasticity And Plastics: Thoughts of Epistemologists

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The term plasticity refers to the ability of a material to change with load, temperature, and any other external stimuli. However, it is crucial to understand that the presence of plasticity does not require an object or system to be made of plastic. Plasticity, as a property, finds applications across diverse fields and holds significant importance, particularly in the domains of neuroscience as it has a direct impact on human cognition and hence body. By leveraging the principles of neuroplasticity, scientists have modulated treatments and interventions that instill hope in the quest to enhance cognitive function, motor skills, and overall quality of life for individuals grappling with neurological conditions which includes spectrum of disorders and anomalies.

As researchers and scientists, we are extremely diligent in using terms, acronyms, and jargon, as “*words are like tools*”. The word plastic hails from the Greek word ‘plasticos’ which means the tendency to deform under heat. The plastic property of materials is not restricted to plastics and polymers; it has its footprint in many metals and even fluids, where it is referred to as ‘pseudoplastics’.

In recent days, as a result of the advent of technology, the new era of technology has seen the genesis of ‘shape-memory alloys, which are deformable under external load and regain their original shape after some length of time with an external stimulus like temperature.

Plasticity is very widely used in many domains, including neuroscience, which ubiquitously uses the word neuroplasticity. In this particular context, the brain cannot have a physical deformation; it has much to do with the series of new connections, which are called neural synapses.



Neuroplasticity or neural plasticity, is the remarkable ability of the brain to adapt and reconfigure its neural pathways, forging new connections and compensating for damage or loss in specific areas. This inherent capacity allows the brain to undergo structural, functional, and connectivity changes in response to a wide range of experiences, learning endeavors, and environmental stimuli. A famous saying by Donald Hebb, “Neurons that fire together wire together”, means that every stimulus, environmental factor, and experience will create a network of neurons that fire together.

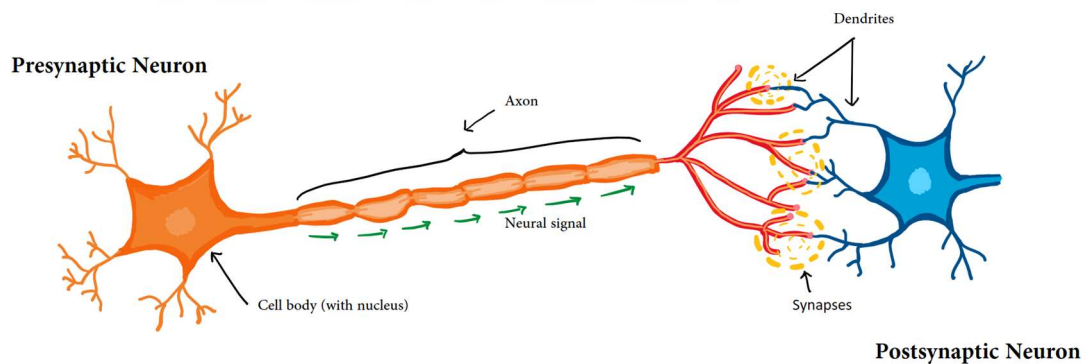


Fig. 1 Neuron

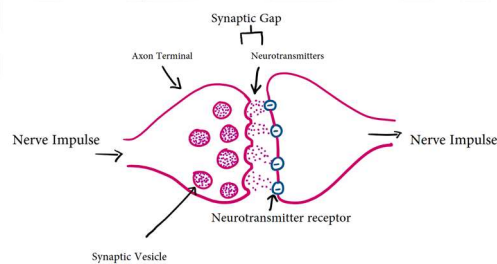


Fig. 2 Synaptic Transmission



Much of the diseases are psychosomatic of origin as mind has an active part, which means that cognition will trigger many of the body's symptoms, which will deviate from normal behavior. Using this neuroplasticity, Prof. Wendy Suzuki (New York University Center for Neural Science), a neuroscientist, brings forth the biggest advantage of physical exercise on neuroplasticity, which has immediate and long-lasting impacts on our brain and its ability to tackle real-world problems. Exercise has the ability to protect the brain from conditions like depression, dementia, and Alzheimer's by strengthening and volumizing the hippocampus and pre-frontal cortex. Researchers have found that there is no such thing as a purely genetic disorder, and persistent physical activity and cognitive stimulation delay or sometimes even prevent these 'genetic' diseases. Although it is preventive in origin, in recent days neuroscientists, in collaboration with bioengineers, are fabricating devices for **neuromodulation**, which can be a precursor for alleviating the symptoms of disorders like dementia, schizophrenia, depression, and many others. These innovative treatments aim to optimize neural pathways, fortify existing connections, and establish novel ones. By leveraging the principles of neuroplasticity, these interventions instill hope in the quest to enhance cognitive function, motor skills, and overall quality of life for individuals grappling with neurological conditions.

We as scientists are extremely hopeful of improving the quality of life of humans with brain plasticity, which is much more beneficial than material plasticity.

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