NEUROPLASTICITY

Neuroplasticity, also known as neural plasticity or brain plasticity, is a process that involves adaptive structural and functional changes of the brain.

The ability of the nervous system to change its activity in response to intrinsic or extrinsic stimuli by reorganizing its structure, functions, or connections.

the ability of the brain to form and reorganize synaptic connections, especially in response to learning or experience or following injury.

"neuroplasticity offers real hope to everyone from stroke victims to dyslexics"

The old view

- The concept of a changing brain has replaced the formerly held belief that the adult brain was pretty much a physiologically static organ or hard-wired after critical developmental periods in childhood.

- That IQ and therefore academic ability are largely hardwired by the genes and set within quite narrow limits by the ages of 6-10.
- The brain is fixed and non-plastic after adolescence.
- Accordingly genes and very early development, result in a brain map that is fixed for life.

- While it’s true that your brain is much more plastic during the early years of life, but this capacity declines with age, plasticity happens throughout your life.

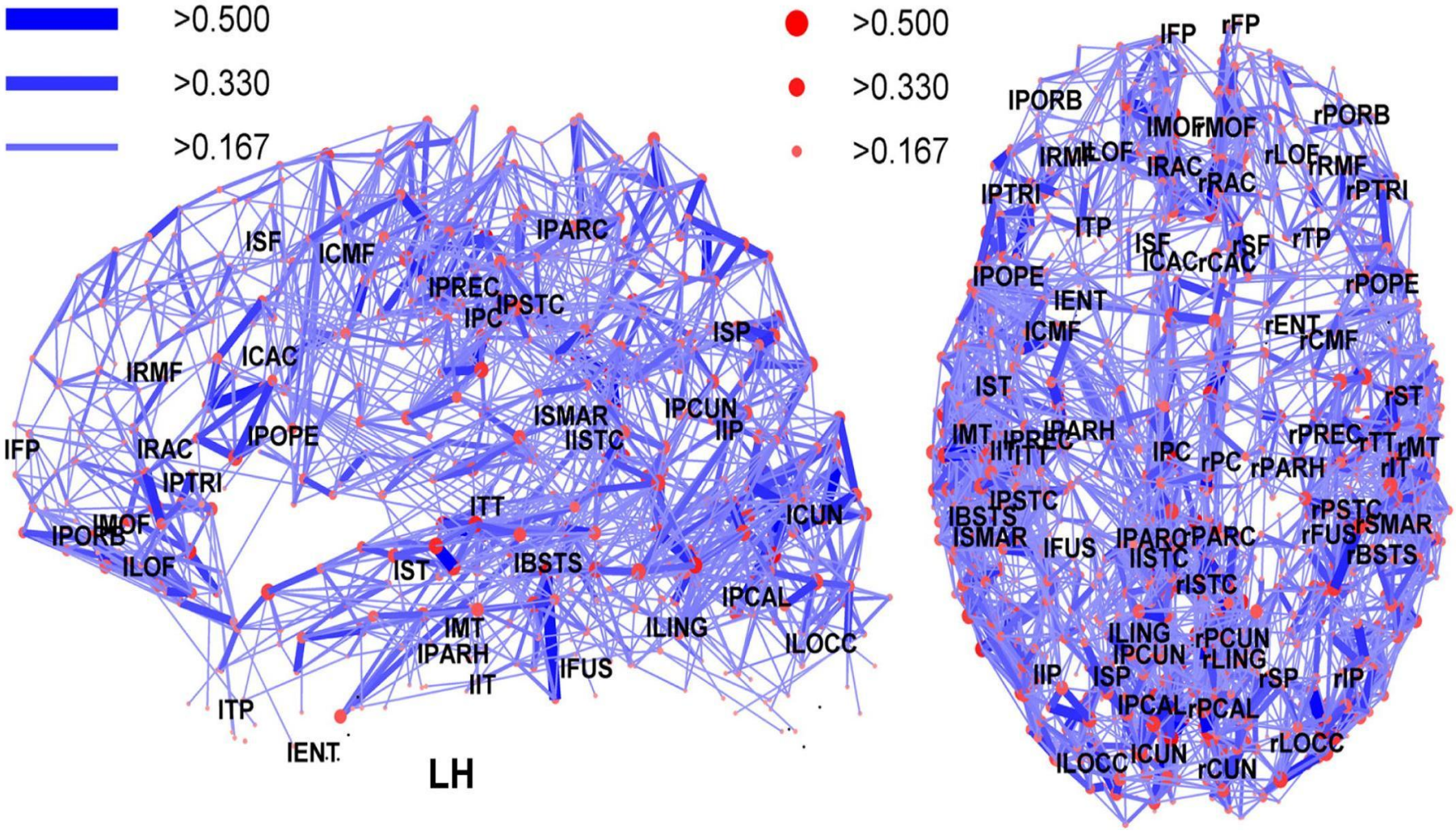
Genes “are not even close to being everything,” and that environment apparently, the family and school environment are very important. Some of the environmental variables affecting IQ are the family environment, qualification, education, socioeconomic status, and high stress during infancy and early childhood.

Before the neuroplastic revolution, neuroscientists believed that in the adult brain everything may die, but nothing can be regenerated.

We now know that this is not true. Neuronal stem cells have the capacity to go on dividing and replicating themselves endlessly, without any sign of aging. This rejuvenating process is called neurogenesis. Neurogenesis goes on until the day we die

One important way that the brain changes and remaps itself in response to experience is by increasing or decreasing the number of synaptic connections between neurons.

The number of these connections is unimaginable.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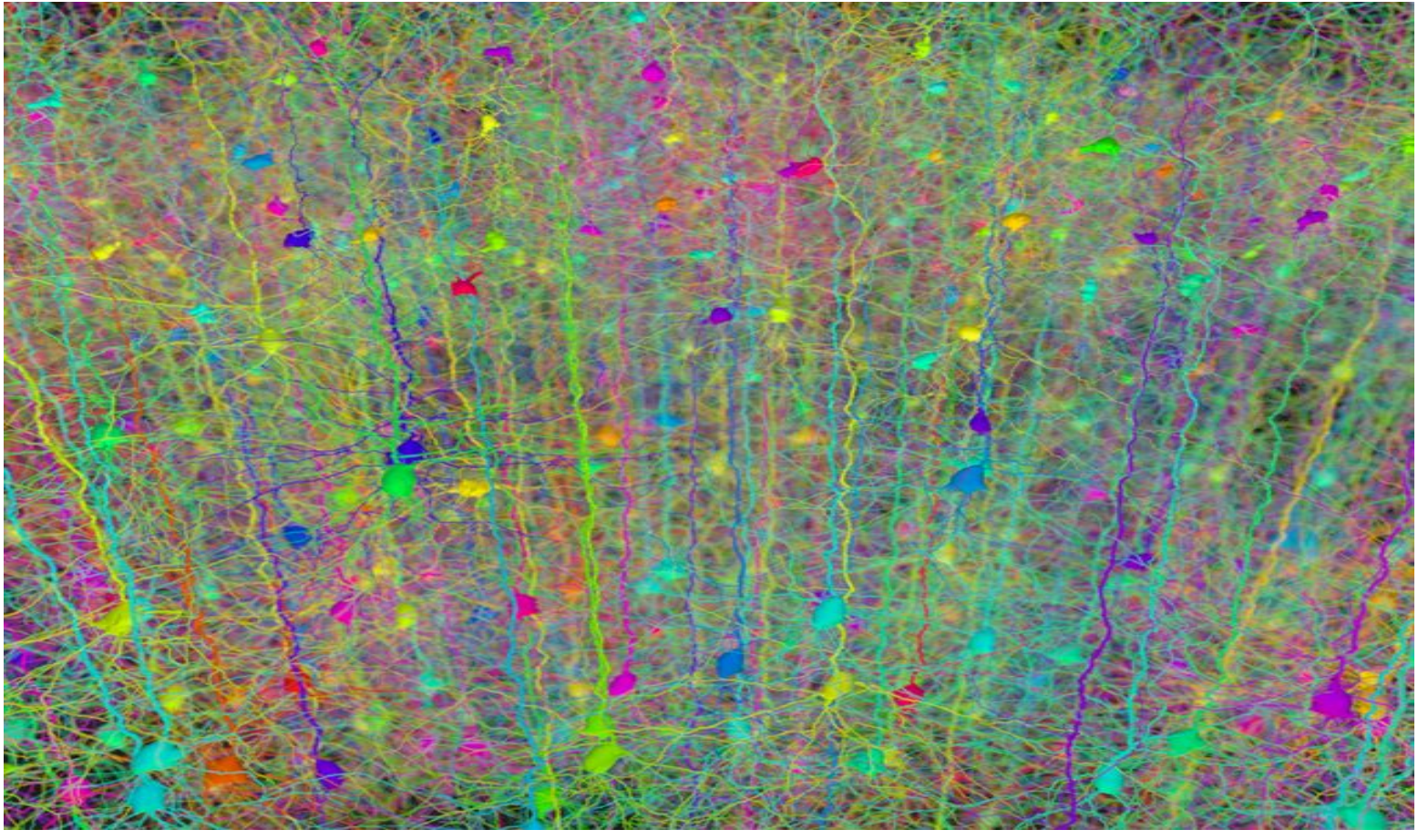
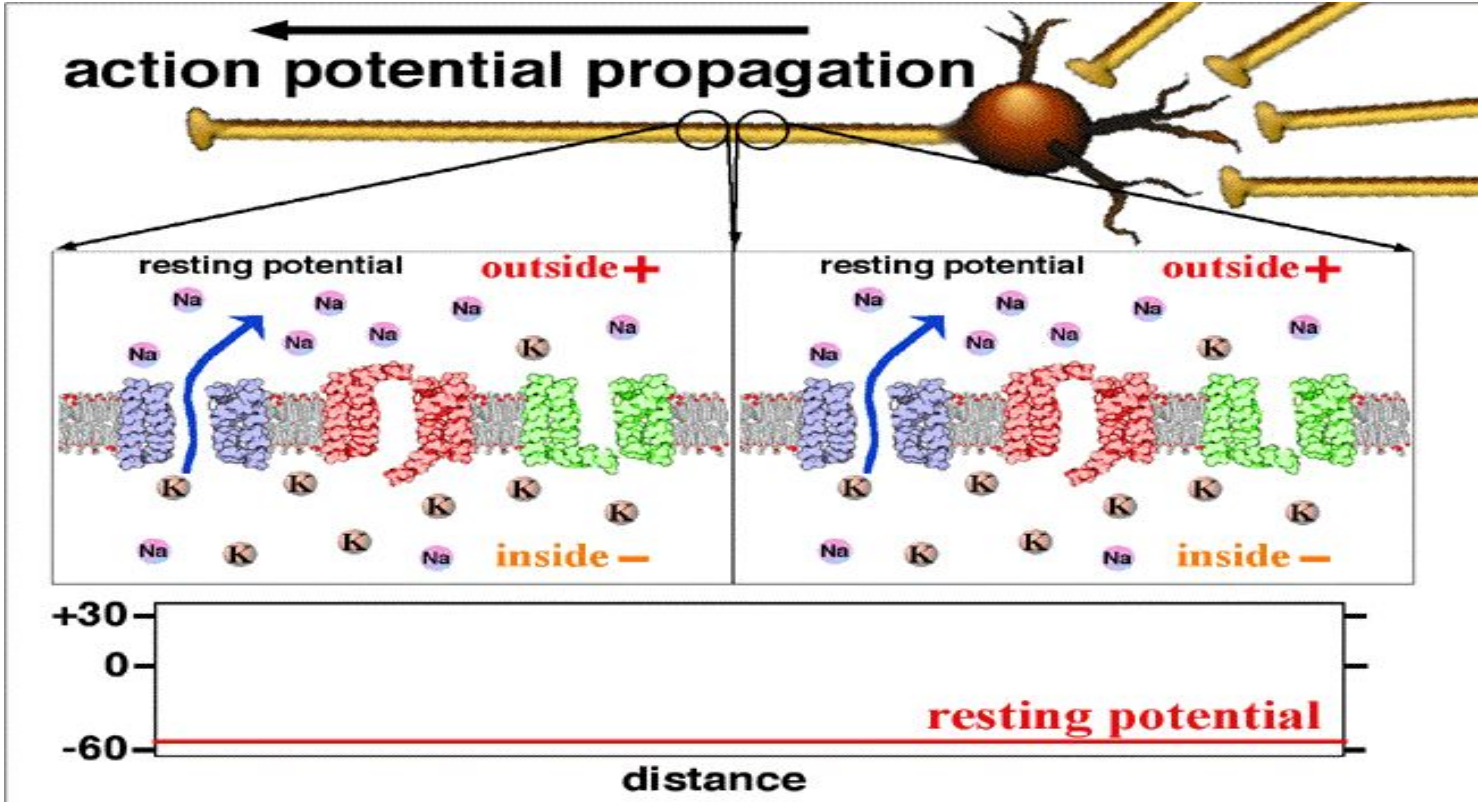
The human brain contains approximately 100 billion neurons. The number of possible synaptic connections and neural circuits involved in the connections between and among these 100 billion neurons makes the human brain by far the most complicated entity in the known universe.

Gerald Edelman has calculated that the number of possible neural circuits in the brain is 10 followed by a million zeros. If this is compared with the number 10 followed by 79 zeros, which is the estimate of the total number of particles in the universe.



Nonsynaptic plasticity is a form of neuroplasticity that involves modification of ion channel function in the axon, dendrites, and cell body that results in specific changes in the integration of excitatory postsynaptic potentials and inhibitory postsynaptic potentials.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When entire area of the brain is adversely affected, other parts can take over, thereby overthrowing the ” one location, one function theory “ of the brain.

After neuroplasticity-based therapy, the size of the affected parts of the brain has been found to double.

Changes in functions were not just behaviorally, but also in brain structure, brain scans like fMRIs, PET scans, CT scans, and surgical procedures involving microelectrodes stimulation .

Neuroplasticity involves the higher cognitive functions as well as memory and motor and sensory functions. No part of the brain is an exception.

IQs of mentally retarded individuals have been raised. Even thought imagination per se, as brain scan technologies have clearly demonstrated, can change the structure of our brains.

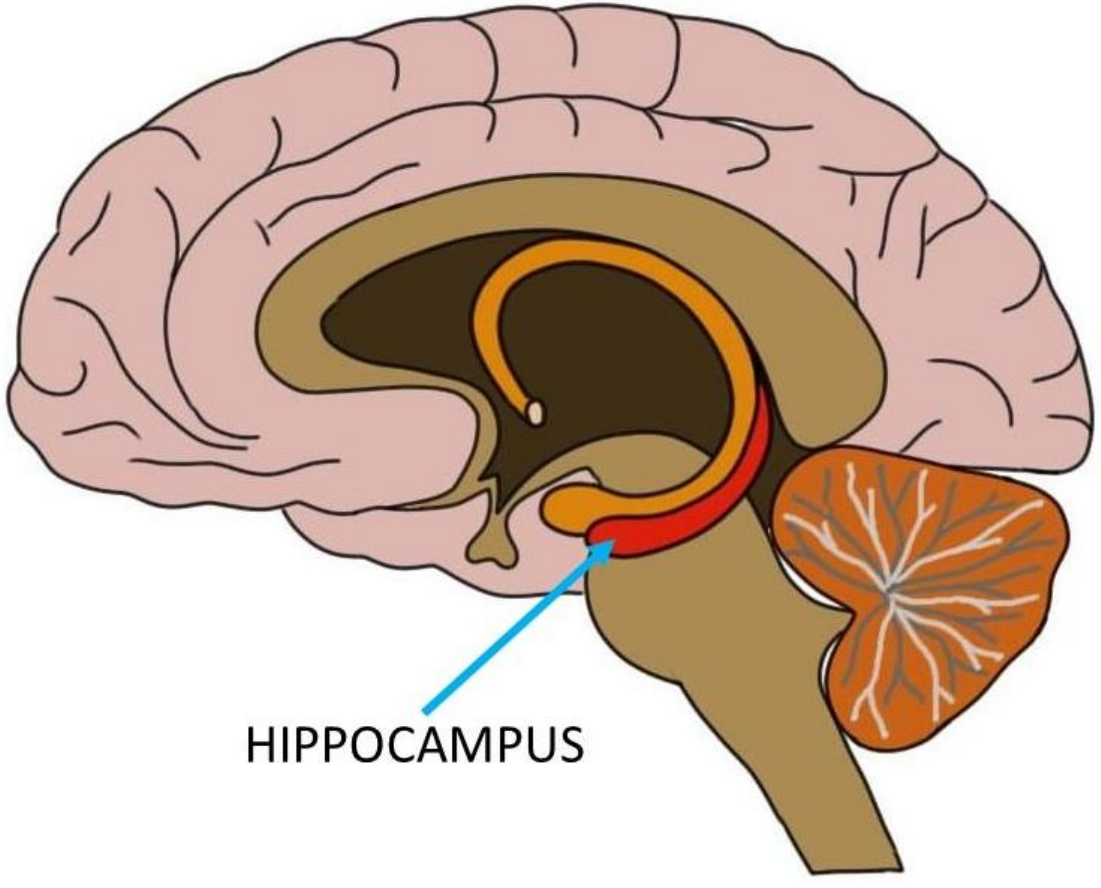
Mental training or life in enriched environments increase brain weight by 5 percent in the cerebral cortex of animals and up to 9 percent in the areas that the training directly stimulates.

Trained or stimulated neurons develop 25 percent more branches and increase their size, the number of connections per neuron, and their blood supply.

Rats in enriched environments have been found to have 40 thousand more neurons than the control group. Older rats in the enriched environments have a fivefold increase in the neurons in the **hippocampus**, and demonstrated greater gains in tests of learning, exploration, movement, and other measures of mouse intelligence than those raised in unenriched conditions.

Children raised in nurturing environments might be more secure, confident, and capable of dealing with later challenges, while those raised in less enriched settings might feel anxious and unable to cope with life's difficulties.

The hippocampus plays a crucial role in the formation of new declarative memories, and it has been theorized that the reason human infants cannot form declarative memories is because they are still undergoing extensive neurogenesis in the hippocampus and their memory-generating circuits are immature.


HIPPOCAMPUS

Neuroplasticity occurs more rapidly and massively in fetuses, neonates, and early childhood, but it is an ongoing process. It goes on all the time, involving all parts of the brain and all brain functions (including cognition), as part of our normal response to experience, and not just in response to major trauma.

The use of neuroplasticity to repair and improve brain functions becomes inevitable. There is a reason to believe that schools will also be able to use research results of neuroplasticity to improve cognitive skills and learning transfer.

We have reasons to hope that, sometime in the future, technologies for early intervention that produce dramatic and permanent changes will be developed. For that matter, the future will bring technologies for manipulating genes that achieve the same goals.

The beneficial effect of multilingualism on people's behavior and cognition is well-known nowadays. People who study more than one language have better cognitive functions and flexibilities than people who only speak one language. Bilinguals are found to have longer attention spans, stronger organization and analyzation skills, and a better theory of mind than monolinguals. Researchers have found that the effect of multilingualism on better cognition is due to neuroplasticity.

specific programs and techniques that have been developed to change brain maps and improve all kinds of brain functions, including cognitive functions are now available .

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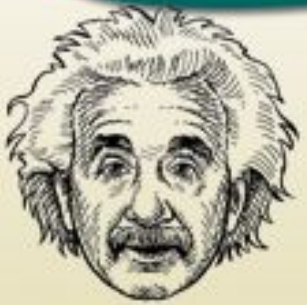

"Geniuses don't have more brain power than the average person, they just use their brains more efficiently"

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Many thanks for your attendance, listening, and patience.