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Learning: A Rudimentary Historical and Philosophical Exploration

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Abstract
This is a philosophical paper that explores learning. Learning involves 'learner' and 'what to learn about'. For this paper, latter is the world around of which the former is a part. The 'world around', started with the Big Bang. That entailed the physical world and the laws that it obeys. Life came into existence because the physical world and the laws made it possible. We humans are the most evolved form of that life because we have evolved learning capabilities.
Key words: *Big Bang, cognition, evolution, neurons, synapses.*

Introduction

Big Bang is the accepted theory about the origin of the universe. According to the theory, enormous amount of energy converted into matter. Within a short period, matter, space, time and the laws of nature came into existence. At some stage, life as a single cell, amoeba formed. It evolved by random mutations; eventually to homo-sapiens. The paper explores, in short, the processes that led to the humans learning various activities. It is noted that the process is that of trial and error. If the desired result is obtained by an action; it is repeated and learnt. Our brains undergo physical changes in the neurons and their connectivity to accommodate the learning.

The World Around

In his book, *The First Three Minutes, (1977),* Weinberg writes that man has been looking up in the skies for centuries. It is only four hundred years ago when he started understanding correctly, the world around. Respectable scientists would not attempt to propose theories about the origin of universe, up to even two decades ago. It is because there were no dependable and accurate observations available for such theories.

It all started with an explosion which filled all space with every particle rushing from every other particle (Weinberg, 1977). The particles that were rushing from each other were the elementary particles of matter. These were electrons, positrons and photons. During the explosion, these particles were continually being created, out of pure energy. Some heavier particles, protons and neutrons also came into existence. These form the nuclei of atoms, as we know them today.

It is after about three minutes that the temperature was cool enough; one billion degrees centigrade. This is when protons and neutrons began to form into nuclei. After a few hundred thousand years, atoms of hydrogen and helium were formed. Due to gravity, these gases formed clumps, which became galaxies after condensation, *ibid (1977)*.
The Big Bang theory is supported by some scientific evidence. For example, the universe is actually expanding and that the universe has a certain amount of energy everywhere which has been observed (Big Bang https://en,m. Wikipedia.org).

Laws and Forces of Nature

Nature follows certain laws. These laws and forces hold everywhere in the universe and must have started with the universe itself (Weinberg, 1977). That means, within the first fraction of a second, when our universe was smaller

than a football, the laws and forces had been established. We the thinking beings (the learner), are ultimately the result of all those laws and forces in our universe (the world around).

Life

Big Bang brought about matter, energy, time and space about 13.5 billion years ago. About 3.8 billion years ago certain molecules combined to form organisms. These were the cells, the foundation of all life. Alice Roberts (2014) says that living things are so very strange. A bacterial cell, one thousandth of a millimeter, is like a nano-factory, with components at molecular level, one millionth of a millimeter. It extracts energy from environment, stores it in chemical forms to build, control and regulate the cellular machinery. It is very complex.

Learning

The physical laws of nature came into existence with the Big Bang. The matter so formed, just obeys those laws. Learning, as we understand, is the trait of 'life'. It is not yet clear, how the cells, the basic form of life, came into existence from non-living matter. However, the cells 'learnt' or had in-built, characteristics of survival and multiplication. These characteristics belong to all forms of life. By the processes of evolution, natural selection and survival of the fittest; the single cell life became homo-sapiens, or the human beings.

The humans learnt to stand and walk on two. Richard Dawkins (2004) writes that it is difficult to find a correct explanation for our ancestors' standing up on their hind legs. There is no benefit in terms of speed or efficiency. One convincing reason put forward is that of freeing the hands to do other things. One can carry food while walking on two. Perhaps our ancestors carried food, whenever they found enough, to their children or mates or to store for future consumption.

Some scholars suggest that the male who would bring food to the nursing and weak females, had a reproductive advantage over other males. According to the theory, the males who walked on two and carried food to the females were favored for mating. They produced offspring with this trait.

Other possible advantage of walking on two was the benefit of height. Standing upright provided a better view over the tall grass. Another advantage proposed by some scholars is that while standing, the body is lesser exposed to the hot sun than while on four. It is mostly the top of the head that takes the heat while standing, which developed protection by the hair.

The process, here, was natural selection. Those who walked on two, by chance, benefitted. They had food for prolonged periods; got more mates and their offspring carried the trait. Similarly, walkers on two could have survived against the hot sun or from predators and multiplied.

Occurrence of certain trait by chance and then it being found useful for survival and multiplication cannot be considered 'learning'. The learner has to attempt some actions. All of which, may not bear any fruit. If some do have a favorable result and the action is then repeated knowingly for the 'result'; it is learning. Therefore, trial and error is a process of learning. There is this commonly cited example of the lab mouse. The mouse comes across a lever and presses it which gets it a piece of cheese. With repeated trials, the mouse 'learns' that pressing the lever, delivers food. In the theory on 'walking on two', above, it can be proposed that our pre-'homo-erectus' ancestors kept trying different variations of mobility. Those who adapted to walking on two, had an advantage. They procreated more and among their offspring, if the trait was inherited, they had better chances of survival. Over long period of time, the walkers on two evolved. In other words: those who 'learnt'; evolved. Can we extrapolate that those who had the potential to learn; survived to evolve into human beings?

Yuval Noah Harari (2014) writes in *Sapiens* that walking on two had advantages. Hands became more and more useful with brain areas controlling them developed with muscles in the palm and fingers. So, humans can perform intricate tasks with hands. Walking upright required narrower hips but that constricts birth canal. At the same time, with the brain developing, babies' heads were getting bigger. It led to earlier or premature birth, with many vital organs underdeveloped.

Human babies needed more time, than any other species, to mature and fend for themselves. Not many parents survived in the hostile environment. Thus societies emerged. The groups, who learnt to give-and-take, understand others' intentions and cooperated, had their off springs cared. Again; those who learnt, survived.

Living in groups, led to development of language. About 70,000 years ago, the cognitive revolution kick-started. The brains of homo-sapiens had developed enough to imagine. They could create the objects which were not in their 'world around'. Archeologists have uncovered artifacts of that period. For example, there is a clay statue of a man with a lion head. Its maker saw a man, a lion and then imagined the sculpture.

By now the human brain was at its best, in history, to explore and learn the world around. Harari writes that 60-kilogram mammals have average brain of 200cc; earliest man, 2.5 million years ago had 600cc; modern sapiens have 1200cc. The human brain is 2-3 % of body weight, consumes 25% of energy, when body is at rest. In humans, the brain developed at the cost of body, for survival. But this choice gave enormous capability to learn and then to maneuver the world around; much more than just to survive!

Dawkins (2004) says in *The Ancestors' Tale* that animal husbandry might not have developed overnight, as a revolutionary idea. Hunting territories might have been guarded against other hunters. Next step would be to guard the herds, and then to feed them and finally to house them. That means, people observed and learnt the behavior of herds of herbivores in nature. Then they controlled, step by step, learning and then possessing them.

There must have been a time when people first noticed that if you put seeds in the ground, they grow into plants giving more such seeds. With time the importance of watering and weeding were learnt. This led to agricultural revolution. Concept of a home came with a settled agricultural lifestyle which led to specialization. The crafts of potters, weavers, blacksmiths and carpentry developed. These people exchanged their skills with food and other produce. The specialized crafts must have demanded systematic learning.

Blakemore (2018) writes in *Inventing Ourselves* that it has been found that gray matter in the brain increases during childhood; peaks during late childhood, and then declines dramatically in early 20s. Gray matter is made up of cell bodies and synapses. Synapses are the connections between the cells. Originally these connections are produced in abundance, during early childhood. With time, till the age of 20s or even up to 30s, the synapses which are not used; are eliminated.

Simultaneously, another thing is going on in the brain. The connections between the cells, which remain, are coated with a white substance called myelin. The purpose of the coating is to speed up transmission of signals between different cells. Myelin acts as an insulator. The myelin coating accounts for the increase of white matter in the brain. As an adult, you do not give a detailed thought to each situation. You have strategized in general (learnt). There is, more or less, the same response in similar situations. Habits have been formed and a unique personality developed. Lesser neural connections are needed. The synaptic routes followed frequently, get coated with the insulating material myelin. Moreover, the synaptic routes which are not used for long are dissolved or eliminated.

Conclusion

Learning is necessary for life. Amoeba, the initial form of life survived just because it had learnt to avoid danger and look for 'food'. It floated free in water; moving away from the chemicals that could destroy it. In water, the concentration of the chemicals decreases as we move away from source. This increase and decrease of concentration must have guided the cell. It is possible that certain other types of life developed before amoeba but could not 'learn' the survival traits and became extinct.

Laws of nature came into existence with the universe and apply to everything including to 'life-forms'. Science has not yet been able to uncover those laws as one theory. We study them as laws of physics, chemistry, biology and others. This is the human endeavor to learn the world around.

Survival and multiplication are the main traits of all forms of life. Humans evolved, over millions of years, with a very complex brain. It is this brain that led to cognitive revolution around 70,000 years ago; agricultural revolution around 10,000 years ago and scientific revolution 500 years ago. Both the body and brain developed symbiotically. Excess gray matter or neurons in the brain in childhood, shows the enormous potential for learning. Dissolution of the 'unused' neurons in early adulthood; once one has settled, possibly, is to conserve energy. As the running of the 'cognitive machinery' is an expensive enterprise!

In conclusion, humans have enormous potential for learning. In the beginning it might have been for survival. Our brains developed to compensate for a fragile body without bloody jaws, teeth and nails; speed of a cheetah or huge

bulky bodies like elephants or rhinos. The cognitive capability has brought us to the level we are today. With the AI and IT revolutions, which have just started, any prediction for the future would be an under-estimate.

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