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Organic Evolution: A Dynamic Process of Conscious Effort by Organisms

***Abstract*: Mature adults play the key role in reproduction, and they first make conscious effort to respond effectively to any change in the environment. The sustained effort helps them acquire some adaptive traits during their life time. These traits induce epigenetic modification.Supportive evidences have been provided from man, birds, bacteria, cryptobiotic animals,migratory behaviour of animals and escape from predators. In every case epigenetics plays an important role. Consciousness in living organisms has been discussed in details.**

Key words: Organic evolution; consciousness; epigenetics; cryptobiosis; migration.

In 1858 Darwin and Wallace[1] proposed the theory of Natural Selection as the cause of organic evolution. In 1859 Darwin published a book on origin of species. Selection favours those variants in a population which survive and grow in number as compared to others. They are the fittest variants, and the population would gradually change accumulating the characteristics of the favourable variants. Darwin's emphasis was on differential survival and the modern emphasis is on differential reproduction. So the fittest are those who leave more offsprings to the next generation as compared to others. Here we see that variants are produced at random in a population, and it is a chance factor that some variants are favourable in an environment. Is it really a chance factor or conscious effort of some variants in response to environmental demand? The present study addresses this question. All the data were collected from Google and Research Gate.

Evolutionary Entropy: Darwinian fitness is now determined by evolutionary entropy which is a measure of the uncertainty in the age of the mother of randomly chosen young ones[2-4]. Evolutionary entropy predicts the rate of return of a population to its steady state size after random fluctuation in the individual birth and death rates. Thus entropy relates to variation in age specific productivity and mortality. Selection is considered a stochastic process which is controlled by the size of a population, and diversity and abundance of resources.

Natural Population: Natural population contains different genotypes of which some genotypes are more successful in an environment than others. The success depends on the performance of the phenotypes with respect to existing environmental factors. Importance lies in the behaviour of the phenotypes. This behaviour has a selective value. Natural selection tends to maintain genetic variability in a population. Physiologists lay emphasis on individual variation of performance, and this variation is regulated by multiple genes in different loci[5].

Conscious Effort and Evolution: Evolution appears to be directional because of conscious effort by different individuals in a population to adjust themselves to a changing environment. The individuals in a population are not uniform, but varied with respect to morphological, physiological, genetic and mental characteristics. Some variants may have greater conscious effort to perform successfully in the environment than others. This effort-induced successful performance, acquired during the life time of those individuals, is transmitted through epigenetic modification to the next generation, and thereafter generation after generation. The sustained conscious effort through generations help in accumulation of environment oriented adaptive characteristics in the successful group.

Evidences: Some examples are found in the young ones of humans and birds. Human babies usually crawl using both hands and legs and gradually they learn to stand erect on the legs from their parents and other adults in their vicinity. It is also found in birds. Young birds learn flying from their parents. In both the cases conscious effort is needed to perform the activity of the adults. Here ontogeny recapitulates phylogeny with respect to behavioural performance of young ones. At an early age children show disruptive behaviour (DB) in the form of violence, stealing and other antisocial activities. DB would change when they learn socially acceptable behaviour from

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their parents and other adult people in their environment[6]. The learning occurs through their conscious effort. Their genetic makeup alone could not help them adopt normal behaviour at early age. Behavioural traits can be transmitted from mother or father by epigenetic modification through somatic and gametic mechanisms[7-8].

Epigenetics and Lamarck's Theory: Epigenetics is a branch of genetics which describes differential expression of certain genes without changing the DNA sequence. Here some genes are turned off or silenced, and some others are turned on or activated. The phenomenon may be transient or permanent. DNA methylation and histone modification are responsible for epigenetic change. Individuals can acquire some traits during their life time, and these traits are transmitted to the next generation and following generations by epigenetic modification[9-10]. Here also we see that conscious effort is a prerequisite before development of somatic and genetic characteristics. Lamarck's theory (1809)[11] of inheritance of acquired characters, once viewed with suspicion by evolutionists, is now gaining support because of current research on epigenetics. Lamarck proposed that the inherent force in an organism tends to modify the organism either in part or as a whole according to the environmental need. The effect of use and disuse produced on an organ during the life time of an individual would be transmitted to the next generation. But he could not give any distinct proof in favour of the theory. At that time genetics was not discoved. It is now known that environmental changes experienced by parents induce changes in DNA methylation and histone modification, and thus affect their offsprings. These changes continue through generations. So phenotypes are not only shaped by the genes alone but also by the interaction between environment and resident population[12-13].

Consciousness: Consciousness is a type of behaviour, regulated by brain. It arises from three components like communication, play and use of tool. These components interact through anticipatory behavioural control. This anticipatory behaviour helps in adaptation to environmental disturbances[14]. Consciousness refers to awareness of self and external environment[15].

Consciousness does not always require brain. Protistans do not have any brain or nervous system, yet they can respond to the external stimuli by oriented movement for food and for defence[16]. Euglena, a protistan has the ability to respond to light and shows oriented movement[17]. Planarians are free living flatworms. They have a broad head containing a nerve band, the so called brain, and a tail. When they are cut into pieces, each fragment undergoes regeneration and grows into a complete animal. The regeneration process is dependent on nerve cells called neoblasts, which are distributed in the whole body except pharynx. FoxA gene plays a crucial role in regeneration[18-19]. We see here that regeneration needs no brain. We can assume that each fragment is conscious in some way, and helps in regeneration of whole body.

Many lower organisms like planktons are able to respond to environmental factors like temperature, resources, predators, chemical stressors etc. Responses are reflected in morphological and physiological traits[20]. It may be assumed that there is a conscious effort on the part of the planktons to respond to environmental condition. Suitable genetic changes occur even in bacteria in response to the environmental demand. This was experimentally demonstrated in *Escherichia coli*. When *Escherichia coli* was exposed to an antibacterial drug, the bacterial fitness shifted to the new environmental demand resulting in accumulation of drug resistant mutations in the population. The drug resistant bacteria could continue to flourish even in the absence of the inducing agent in their environment[21].

Cryptobiosis: Consciousness is suspended for a long time in some organisms. This phenomenon is called cryptobiosis. It occurs in invertebrates like nematods, tardigrades and insects in the post embryonic stage. During cryptobiosis metabolic activity of the organisms is so minimised as it is almost immeasurable. They become completely dehydrated but can revive after a pretty long time when suitable environment is available[22]. Cryptobiosis is a strategy whereby the animals can avoid periodic environmental fluctuation and concomitant selection pressure by maintaining their active forms in a more or less favourable condition. Those animals have undergone very little morphological changes. Obviously genetic variability is also minimized. They have some common characteristics like constancy in the number of cells in their body, incapability of regeneration and parthenogenesis[23]. Here we see that by regulating consciousness these animals can maintain their fitness in an otherwise changing environment.

Animal Migration: Migration, a behavioural phenomenon, occurs in fishes, birds mammals and invertebrates for food and breeding in a favourable environment. Migratory behaviour offers another example of conscious effort in animals. Migration, usually triggerred by seasonal changes, may cover short or long distances across continents. In some species phenotypic variation relating to migration is incorporated in genes, but in others the variation results from epigenetic modification[24]. It appears that during unfavourable environment due to extreme temperature, scarcity of food and water etc. some individuals have felt an urgent need to leave the habitat in search of a better place for survival. They have acquired some migratory traits relating to orientation, navigation and sustained movement. This acquired traits gradually induced epigenetic changes followed by genetic changes. Since different stages of these changes are observed in migratory species it can be assumed that migratory behaviour has been initiated by conscious effort.

Partial migration occurs in fishes. Mature adults of some species migrate from sea to fresh water steams for spawning while resident population remains in the sea. They are called anadromous fish like salmon and trout. The impulse to migrate may be due to environmental, physiological and hereditary factors[25]. In case of rainbow trout patterns of anadromy and residency indicate environmental influence at different stages of life in their fresh water and marine habitat[26]. Again migratory and resident life strategy in Dolly Varden is epigenetic[27]. Here we see that migratory fish feel an urge to migrate, and the clue comes from their environment.

Escape from Predators: Tungara frogs (*Engystomops pustulosus*) have terrestrial and aerial predators. The frog moves away from its attacker the snake. But when a bat swoops down on the frog the latter moves towards the bat so that the aerial predator misses the prey. This study shows predator-specific escape strategy of the prey for its survival[28]. The frog performs this protective response by conscious effort.Besides breeding purposes fish also migrate from lakes to streams to escape predation by cormorants[29]. The European viper has a zigzag colour pattern on its back.When the snake remains immobile it avoids detection by its potential predators. The same colour pattern during exposure provides warning signal to its enemy. This zigzag pattern creates confusion to its predators when it moves away from the predator[30]. All these examples provide further evidence in support of conscious effort of animals in response to an adverse situation in the environment. Mimicry, an escape strategy, occurs in many animals. Here a mimic (a palatable prey) copies another species of a dangerous animal (model) thereby avoiding potential predators in their environment. Predators also adopt some strategies to attract their prey (https://www.sciencedirect.com/topics/earth-and-planetary-sciences/mimicry). Here also conscious effort plays an important role for development of adaptive traits associated with mimicry.

Concept of Conscious Effort: Earlier Raut[31] proposed that will force is the cause of evolution. According to him an element or object has a self-force, and this is actually will force. Obviously, this ‘will force’ carries a meaning different from that of ‘conscious effort’. We have already explained consciousness and conscious effort.

Organismal performance in response to environmental changes contributes to Darwinian fitness. Individuals in a population first sense the change in exiting environment. Then they make conscious effort to cope with the emergent situation for survival. In this way they acquire some morphological and physiological characters, which help them adjust to the change in environment. The characters acquired during their life time are transmitted to the next generation by epigenetic modification. So, the initiator of any adaptive changes in a population is conscious effort. This inherent quality of living organisms lead to evolutionary changes in a population. This conscious effort is not uniform in all individuals of a population, and adaptive success of certain individuals depends on strength and persistence of their conscious effort. Sustained conscious effort of those individuals generate adaptive traits first which in turn induce epigenetic changes in the progeny. It may be mentioned here that endeavour and perseverance have both environmental and genetic influence[32]. The conscious effort may be triggered by environmental change, and successful adaptation in subsequent generation has a genetic root.

Conclusion: Evolution in organisms occurs due to differential survival and reproduction of some successful individuals of a population in an environment. The process starts by conscious effort of some individuals in response to the environmental demand. The phenotypic changes acquired by the individuals during their life time are transmitted to the next generation through epigenetic modification. Epigenetics provides support for Lamarck’s theory of inheritance of acquired characters through use and disuse of organs according to environmental needs. In course of time genotypes also undergo necessary adaptive changes. Examples are provided from the learning behaviour of young ones of birds, mammals and man. Genetic changes in bacterial populations in response to antibacterial agents in the culture serves another example. Consciousness is a property of living organisms, but brain or nervous system is not essential for this property. Many protistans can respond to external stimuli. Even a fragment of a free living flat worm can regenerate its complete body. Cryptobiotic animals like nematodes, rotifers, tardigras and insects can regulate their consciousness and avoid unfavourable environmental change. This phenomenon reduces morphological and genetic variability in them.

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