Term Paper

[Name of the Writer]

[Name of the Institution]

Evolution Inner Fish

**Introduction**

 Evolution is the change of inherited characteristics in a living population over many generations. The process of evolution can be defined in an effective manner through the concept of natural selection. It is one of the basic mechanisms of evolution as it helps in validating the concept of evolution. Other factors that also explain evolution include migration, mutation, and genetic drift. The natural selection indicates that certain inherited characteristics of organisms are favored within a population. With the help of natural selection, one can easily determine why living organisms change their inherited traits to incorporate within an environment.

**Process of Evolution by Natural Selection**

 One of the most important things for an organism is to survive in a particular environment. Darwin’s theory of evolution identifies that living organisms adapt to the process of natural selection as it is the only way of survival. Natural selection is the process that determines the instincts of organisms to reproduce in a particular environment and adopt changes accordingly. The phenomenon of natural selection is understandable in two specific ways. First, inherited traits are eliminated from an organism as it contains potential disadvantages to contribute towards the success of the organism. Second, inherited traits persist in living organisms as it is essential for their survival in the changing environment. It is notable to mention that the shapes, sizes, colors, and behaviors of an individual are determined by the concept of selective pressure. Changing environments have changed the abilities and characteristics of an individual to survive and reproduce in an environment where they evolved over thousands of years (Milot et al., 2011). Darwin provided within an impressive explanation regarding natural selection by elaborating the term “survival of the fittest”. Only those organisms in the past managed to survive who had the best characteristics for a particular environment. For instance, peppered moths managed to survive in the changing environment by adopting the characteristics of camouflage against light lichens on trees. The camouflage characteristics of peppered moths enabled them to survive and reproduce rather than eaten by birds.

**Process of Evolution by Different Approaches**

 To strengthen the concept of evolution, it is highly necessary to describe it with the help of various approaches. The potential approaches that can explain the process of evolution include paleontology, biogeography, geology, comparative anatomy, molecular biology, genetics, and physiology. Paleontology is referred to as the study of the history of life on Earth regarding fossils. The process of evolution can be explained with the help of paleontology as the study of fossils and their footprints support the understanding of evolution. After death, living organisms become a part of the ground. The concept of paleontology provides us with the ability to identify what they looked like as they leave imprints behind. A biological timeline has been formed with the help of fossils layers. Different layers of ground provide with fossils record of the different period through which a sequence of historical changes in these organisms can be identified. Visual imprints of fossils and sequence of historical changes have successfully dictated the idea of the process of evolution. With the help of radiometric dating, the age of fossils and rocks can be identified, which help to validate the idea of the process of evolution. On the other hand, biogeography also has the potential to validate the idea of evolution. Biogeography sheds light on the natural habitats of various organisms in the entire world. It is important to consider the idea that biogeography helps to determine the actual reason behind the current habitat of organisms. It presents valid points to understand why organisms are in present locations. In the theory of evolution, Charles Darwin suggested that organisms evolved over time from a common ancestor. Organisms on the South American mainland are similar to those on the Galapagos Islands. Darwin presented the idea that organisms that were living on the South American mainland were migrated to Galapagos Islands (Thagard & Findlay, 2010). With the passage of time, the same organisms evolved themselves in accordance with their new environment. For instance, the idea of evolution is justified with the help of biogeography as there are no penguins in the arctic and no polar bears in the Antarctic regardless of the fact that both places are cold and icy.

 Comparative anatomy is referred to as the study of resemblances and dissimilarities in the structure and parts of different organisms. The idea of evolution can be explained with the help of comparative anatomy as the species that are related to each other should also have indicated some common characteristics. Comparative anatomy provides valid evidence that forelimbs of bats, dogs, whales, and humans are associated with each other as they present the same skeletal elements. Critical observation of various mammals indicates that skeletal elements in the forelimbs are the same, while their function is completely different as compared to other mammals. For instance, the functioning of the bat’s wing is clearly different as compared to the functioning of human’s arms. Organisms evolve their body parts to meet a changing environment, but their skeletal structure remains the same. The idea of evolution can also be explained with the help of geology. It is the study of earth and the process by which it changed over time. The interpretation of various characteristics of rocks provides a better idea about different phases of the earth’s history. Geological sequences provide a better insight into the beginning of life on earth and how geological constraints evolved organisms with the passage of time. Molecular biology is the study of different macromolecules including nucleic acids and proteins regarding their structure and function. A critical examination of organisms’ body with the help of molecular biology determines the change in the sequence composition. The change in cellular molecules such as RNA and DNA provides a valid explanation of evolution.

Biochemical building blocks such as nucleotides and amino acids are the same in all organisms that validate the idea of evolution. A possible explanation of the process of evolution can be provided with the help of genetics. Genes are comprised of specific characteristic codes that are transferred from parents to their offspring. Over thousands of years, organisms had successfully passed these specific traits of codes through genes. Genetic variation is an essential element in evolution as it contributes to the survival of organisms. With the help of genetic variations, organisms can modify themselves to adopt a new environment. Furthermore, the idea of evolution can be explained with the help of physiology as it determines the usual functions of organisms. It indicates that organisms have changed the functioning of their different body parts in accordance with the changing environment. Behavior and characteristics of organisms are changed during the history of the population. It compares basic physiological process such as circulation, thermoregulation, and cellular respiration of one organism with another. These processes indicate that organisms have evolved themselves throughout the history of the earth.

**Scientific Method and Evolution/Natural Selection**

 The theory of evolution is best explained with the help of a scientific method. For the purpose of evaluating the theory of evolution, it is essential to use a basic scientific method that includes observation, experimentation, and verification. The observation in the considered case is that organisms acquire certain characteristics and traits in their lifetime and these traits are transformed into the next generation. Here, our observation is based on the idea that organisms evolved with the passage of time in order to adjust themselves in the changing environment. Next step in this scientific method is to conduct experiments to prove that organisms do evolve in accordance with their changing environment. For this particular purpose, there is a need to use the process of comparative anatomy to identify whether organisms evolve themselves with the passage of time or not. Hypothesized observation in this scenario is that organisms do evolve themselves as they have to survive and reproduce in a given environment. The concept of survival is highly important for each organism on the planet to justify their existing. There is a number of organisms that are extinct due to their limited abilities to adjust and modify their function and behavior in accordance with the changing environment.

A critical examination of skeletal elements and characteristics of forelimbs of bats and humans indicate that they share a common ancestor. It is notable to mention that critical examination of their characteristics validates the concept of evolution due to the resemblance in their skeletal structure. However, the function of these forelimbs is different in both bats and humans, which indicates that both organisms have changed their abilities to survive in the changing environment. Only one experiment does not justify that a hypothesis or observation is valid unless it is confirmed with the help of multiple experiments. For this particular purpose, it is necessary to examine the forelimbs of dogs and whales. The concept and processes of comparative anatomy reveals that the forelimbs of dogs and whales have the same skeletal characteristics. However, the function of these forelimbs is completely different in both organisms. Consequently, these experiments validate the process of evolution and natural selection.

**Interpretation of Evidence for Evolution**

 Interpretation of the evidence of evolution is presented by Neil Shubin in his book “Your Inner Fish: A journey into the 3.5 billion year history of the human body.” Sufficient evidence of evolution is presented by Shubin that explores how a human body has transformed into its current form. It is important to mention that the evolution of the human body by natural selection is one of the most accepted theories as it provides various evidences regarding this matter. A critical examination of various species on the earth indicates that all species have some common features. Careful examination of the fishes indicates that they have the same structure of head as compared to human beings (Shubin, 2008). According to Shubin, the skeletal structure of fishes head and human’s head are same, which validates the process of evolution. Shubin validates the idea of evolution and natural selection by comparing the fish fins with human’s arm bones. Comparative analysis of fish fins indicates that they are evolved with the passage of time to multi-use limbs. Researchers have found that the arms of apes and human have significant resemblance that validates the idea of natural selection. It is a well-known fact in the scientific community that apes are the ancestors of human beings.

Consequently, with the help of comparative anatomy, it becomes clear that human and ape arms have same function and characteristics. The general structure of fish fins, ape arm, and human arm is nearly identical. These evidences critically prove that the idea of natural selection is highly acceptable to validate the process of evolution. Effective evidences are provided by Shubin to prove that all species have something in common with humans. Exploring the building blocks of the human body such as RNA and DNA indicates that the development process of the human arm is evolved through the wings of chicken (Shubin, 2008). A closer look at in-utero development also indicates the evolution of chicken’s wings with the passage of time. It is observed that the transformation of fins into limbs is not due to the development of new genes, as it contributes to the idea of natural selection to survive in the changing environment. It is important to mention that teeth of various carnivores, herbivores, and omnivores have certain similarities that can validate the idea of evolution and natural selection. Teeth of various organisms are well preserved that indicate similar pattern and structure. Moreover, there is another way of validating the concept of natural selection and evolution that includes the structure of the skull. Examining the structure of skulls determines who it is constructed of rods, blocks, and plates. These rods, blocks, and plates are connected with each other in a specific pattern to protect inner parts such as the brain. All species share something in common with human beings, which proves that the theory of evolution and idea of natural selection are valid.

**Conclusion**

 In a nutshell, the idea of evolution is based on the concept of natural selection. Living organisms transformed themselves with the passage of time to survive in the changing environment. The concept of evolution and natural selection is well explained with the help of biology, physiology, comparative anatomy, biogeography, paleontology, molecular biology, and genetics. A critical examination of forelimbs of bats, dogs, whales, and human through comparative anatomy indicates that they share the same skeletal structure. However, they adopt different functionality in accordance with their habitat. Examination of DNA and RNA of organisms indicate that different species evolved through genetic mutation as inherited traits are transferred from parents to offspring.

**References**

Milot, E., Mayer, F. M., Nussey, D. H., Boisvert, M., Pelletier, F., & Réale, D. (2011). Evidence for evolution in response to natural selection in a contemporary human population. *Proceedings of the National Academy of Sciences*, *108*(41), 17040-17045.

Shubin, N. (2008). *Your inner fish: a journey into the 3.5-billion-year history of the human body*. Vintage.

Thagard, P., & Findlay, S. (2010). Getting to Darwin: Obstacles to accepting evolution by natural selection. *Science & Education*, *19*(6-8), 625-636.