Phyletic gradualism and punctuated equilibrium essay

Law, Evidence

\n[toc title="Table of Contents"]\n

\n \t

\n[/toc]\n \n

The inherited characteristics in a species population change over time through genetic drift, mutation, and natural selection. Natural selection was first proposed by Charles Darwin and it explains the emergence of species that are best fitted (adapted) to certain environments in which they live. The mechanism of evolution is explained by the theories of phyletic gradualism and punctuated equilibrium. In this paper, both phyletic gradualism and punctuated equilibrium are evaluated. Phyletic gradualism and punctuated equilibrium seek to explain then rate of evolution.

Phyletic Gradualism

Gradualism is a model of evolution that suggests that speciation is a slow, constant and consistent process. It is not easy to notice the changes over a short period of time such as a few generations. Phyletic gradualism occurs through natural selection in which a species is steadily transformed to new one. Most species produce many off springs with varied traits caused by mutation. The inherited traits affect survival rate. Off springs with traits that are not helpful to surviving in a given environment die young before they reproduce and pass over their inferior characteristics to their off springs. The

off springs with traits that make them fit for the environment survive to adulthood and reproduce passing their suitable characteristics to off springs. The suitable traits accumulate in the population gradually transforming the species into a new one (Barnosky & Kraatz, 2007). Based on phyletic gradualism, the large characteristic traits changes which differentiate one species from another result from the accumulation of many small changes that build up over long periods of time.

Fossil records can be used to map the evolution of a species. Phyletic gradualism suggest that the fossil records of species should consist of many similar species which different small characteristics and time era. For instance, the evolution of man started with changes that differentiated the early man from the great apes. The early man then accumulated morphological changes such as being bipedal and upright as adaptation to the environment. Various ancestors of man such as Austraropithecus, Kenyanthropus, Homo habilis, and Home erectus have been identified from fossil records forming a near complete chain of the evolution of man (Niemitz, 2010). Species with longer evolution usually evolve through phyletic gradualism as evidence from fossil records show.

Punctuated Equilibrium

Punctuated equilibrium is an alternative hypothesis that explains evolution in terms of rapid changes and long period of stasis. The hypothesis of punctuated equilibrium assert that a species exhibit little change in its geologic history. These periods of little change are called stasis and occur when the environmental conditions are uniform over long periods of time

(Barnosky & Kraatz, 2007). When environmental conditions change, mutations occur randomly leading to huge changes in a short period of time. These changes punctuate periods of stasis hence the name punctuated equilibrium. The changes occur over few generations after which the species settle into a new period of stasis. The rapid changes may lead to the process of cladogenesis in which one species splits into two distinct species unlike in phyletic gradualism which asserts that one species gradually transforms to another species (Strotz & Allen, 2013).

Punctuated equilibrium is most effective in smaller populations or groups that are isolated from other members of their species. In large populations, the large volume stabilizes the gene flow and potentially beneficial gene mutations are easily diluted in the large population sample. In smaller populations, changes can easily occur and it is possible to transform a whole linage top another species. Such changes are supported by fossil evidence such as the evolution of molluscs in the Turkana Basin (Van Bocxlaer, Damme & Feibel, 2008).

Debate between phyletic gradualism and punctuated equilibrium provides basis for research in evolution. Life has existed on earth for long periods of time. This is based on evidence that support common descent. Fossilization is an uncommon occurrence and provides sparse and partial data on the evolution of life. Therefore other evidence sources such as comparative anatomy, comparative physiology and biochemistry, geological distribution and observed speciation is used to support the assertion that life has existed for long periods of time on earth. Genetic similarities including use of the same bases in DNA support common ancestry. However, the observed

diversity of life on earth can only occur after long periods of time to allow for evolution to take place. Comparative anatomy analyses the similarities in structural features in plants and animals. For instance, all flowers in plants and limbs in animals are made of the same basic part but vary widely based on the adaptations of that species..

Fossil records of the earliest life forms dated from the strata in which they occur and from radiometric analysis give evidence for evolution. Species that occur in older sediment deposits are absent from younger sediment deposits and are assumed to have evolved into the species found in the younger sediment deposits. This provides evidence for phyletic gradualism. Some fossil records provide evidence of punctuated equilibrium. For instance, the evolution of birds from avian dinosaurs occurred rapidly when dinosaurs were going extinct. The birds then quickly lost teeth and bony jaws and evolved a horny beak (Louchart & Viriot, 2011).

References

Barnosky, A. D., & Kraatz, B. P. (2007). The role of climatic change in the evolution of

mammals. Bioscience, 57(6), 523-532.

Louchart, A., & Viriot, L. (2011). From snout to beak: the loss of teeth in birds. Trends in

ecology & evolution, 26(12), 663-673.

Niemitz, C. (2010). The evolution of the upright posture and gait—a review and a new synthesis.

Naturwissenschaften, 97(3), 241-263.

Strotz, L. C., & Allen, A. P. (2013). Assessing the role of cladogenesis in macroevolution by
integrating fossil and molecular evidence. Proceedings of the National Academy of Sciences, 110(8), 2904-2909.

Van Bocxlaer, B., Damme, D. V., & Feibel, C. S. (2008). Gradual versus punctuated equilibrium
evolution in the Turkana Basin molluscs: evolutionary events or biological invasions?. Evolution, 62(3), 511-520.