Theories of evolution

Science, Biology

Theories of Evolution Concepts of Phyletic Gradualism Phyletic gradualism as a theory hypothesises that all creatures undergo evolution which occursslowly and gradually (Futuyma, 2005). In other words, evolution of the whole species into a new one occurs when throughout time organisms experience small adaptive changes with respect to their physiology and behaviour (Darwin, 1859). Eventually, these small adaptation accumulate and a new species is formed (Futuyma, 2005). Punctuated equilibrium on the other hand is a scientific theory that hypothesises that evolution occurs over time and is characterised by long durations of virtual standstill (stasis) punctuated by periods in which rapid development occur toward the formation of new forms. Concepts of Punctuated Equilibrium and Fossil Records Punctuated equilibrium holds that speciation most likely occurs in a population by involving a small group (Gould, 2002). The small group can be separated geographically from the mainstream undergoing adaptive changes to ensure survival and eventually producing new species that do not interbreed. In this respect, the new species does not leave fossils at the same place as the old species upon being successful. The new species only does so if it is different enough to coexist with it relatives or moves back into its ancestral range. What this means is that fossil records at any place will not record the speciation process. The theory holds that the evolution process occurs too fast to be noted in fossil records (Gould & Eldredge, 1977). This therefore means that the missing links in the gradual evolution theory forms part of the evolution process. Punctuated Equilibrium Evolution Process The punctuated equilibrium evolutionary theory suggests that rapid evolution occurs when a small isolated population experiences strong

selection and fast change owing to the small size of the population and the favourable environment. New selection pressures are exerted on the small population by the new environment and genetic drift influences the evolutionary process based on the peripatric speciation model (Gould & Eldredge, 1977). Furthermore, the adaptive changes in lineages occur mostly during speciation periods. During evolution, the periods of relative stasis are a factor of the large population which implies little genetic drift and unchanging environment. Once the small population which that has undergone rapid change finds a stable environment, evolutionary change will least likely occure (Evolution Berkeley. edu (n. d.). The new species may also outcompete the old ones causing their extinction. Punctuated Equilibrium Evolution Patterns and World History Once evolution has occurred based on the punctuated equilibrium model and a large population of the new population is in existence, occasional fossil preservation occurs. The process produces a fossil records pattern that is characterized by alternating stasis and rapid change fossil layers. Records of some foraminiferans depict the punctuated pattern suggested by the punctuated equilibrium model. The long history of the world is seen in the fact that the punctuated patterns reveal the long passage of time (Avise, Nelson & Sugita, 1994). For example, in the case of the foraminiferans, based on the shape of the shells, the change from Miocene, Pliocene, Pleistocene is shown to have occurred over tens of millions of years. Evidence of Gradual Changes during Evolution Scientists have analyzed fossil records and have evidence of punctuated evolution based on many organisms. For example, fossil records of the bryozoan reveal this kind of pattern. The fossil records reveal that one

species appeared for the first time close to 140 million years ago and remained the same for close to 40 million years from the time of its first appearance (Gould, 2002). Thereafter, an explosion of diversification occurred followed by a long duration of stability. Evidence of Punctuated Changes in the Process of Evolution While it has previously been suggested that the foraminiferans are evidence of punctuated equilibrium, some scientists suggest that the species also show evidence of Phyletic gradualism (Gould, 2002). The species changed not its form from six to 10 million years ago before gradually undergoing a change that lasted close to 600 thousand years. At the end of this period, the new species formed were absolutely different compared to their ancestors. Yet another evidence of phyletic gradualism can be seen in the evolution of Homo Heidelbergensis to Homo Neanderthalensis as evidenced by fossil records. The skulls of the two species were quite similar even as their evolution occurred gradually over a long duration. Phyletic gradualism relies upon the study of modern species as the basis for its principles. These studies put emphasis on the importance of interspecies interaction and geography in the abundance and distribution of transitional specimens. References Avise, J. C., Nelson, W. S., & Sugita H. (1994). A speciational history of “ living fossils”: Molecular evolutionary patterns in horseshoe crabs. Evolution 48: 1986-2001. Darwin, C. 1859. The Origin of Species. London: John Murray. Evolution Berkeley. edu (n. d.) More on Punctuated Equilibrium. Retrieved from http://evolution. berkeley. edu/evosite/evo101/VIIA1bPunctuated. shtml Futuyma, D. (2005). Evolution. Sunderland MA: Sinauer Associates. Gould S. & Eldredge N. (1977) Punctuated equilibria: The tempo and mode of evolution reconsidered.

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