Quantum Speciation Encyclopedia Article

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Quantum Speciation

Quantum speciation, also known as saltational speciation, is the process by which a small population of **species** rapidly diverges into more than one species that is reproductively isolated from the original population. Scientists theorize that quantum speciation occurs because of genetic drift that results from the **founder effect**. Genetic drift refers to random genetic changes within a population rather than **natural selection**. The founder effect occurs because a few individuals from a population colonize a new area and become isolated from the rest of the species. The genes of these individuals have enough **genetic variation** that there is a change in allele frequency from the original population. Through **random mating**, genes may be mutated and alleles may become lost or fixed in the new population. Within a few generations, **chromosome** mutations cause changes in observable physical traits and the new species can no longer breed with individuals from the original population. This process can occur in large populations but is more pronounced in smaller ones. Ultimately, quantum speciation is dependent on isolation, both genetic and physical, and chromosome **mutation** in order to occur and allow the newly formed species to survive.

Evidence from the fossil record suggests that quantum speciation can occur in one or two generations because of polyploidy, the increase in number of chromosome sets. Usually organisms contain two sets of chromosomes, but sometimes polyploidy can occur during hybridization and produce three or more sets of chromosomes. Plants provide the best evidence of accelerated speciation by means of polyploidy. Almost 40% of angiosperms (flowering plants) are polyploids that evolved by this mechanism. For example, scientists theorize that the polyploid sequoia evolved from a **diploid** ancestor. Another example of quantum speciation, although not by polyploidy, is the origin of bats 50 million years ago. The sudden appearance of winged mammals in the fossil record began the new lineage that gave rise to the order Chiroptera.

Some scientists believe quantum speciation to be part of the **punctuated equilibrium** model that is characterized by slow and fast periods of change. This evolutionary theory states that long periods of time with relatively little genetic change are followed by sudden, rapid changes in **genetics** that result in the formation of new species. However, other scientists argue that rapid genetic change may lead to some divergence within a population but is not accompanied by speciation.