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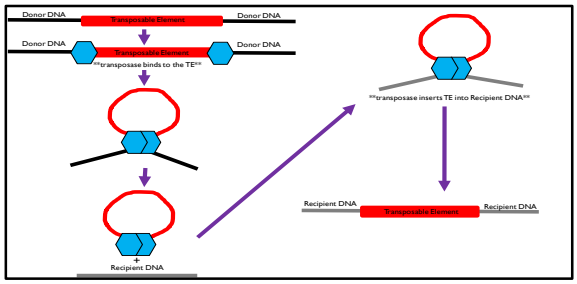
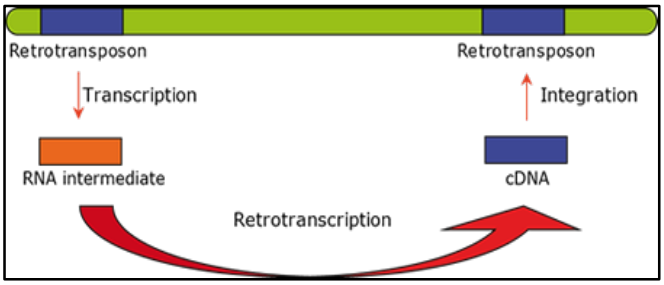
Transposons: The Jumping Genes

Since the early 1900's transposons have introduced a very interesting factor in the world of genetics. Transposons, also known as transposable elements, have the ability to relocate and replicate segments of DNA. These "jumping genes" have many ways of replication such as the employment of transposase, or by reverse transcription. Since any manipulation within the genetic structure of an organisms can cause great defects, and could potentially lead to fatal symptoms, organisms have gathered an arsenal of regulation mechanisms to mitigate and sometimes harness effects of these jumping genes. Because of the nature of transposons, they have a major effect on the development of new and novel genes within organisms. Consequently, these transposable systems are known to initiate genetic divergence by producing new alleles that code for gene products. For example, this can be traced in coexisting species using identity by descent methods in recent common ancestors. Transposons have direct and indirect roles of element activation reducing gene flow which contributes to the process of speciation – transposons move from segments of DNA to change genotypes and phenotypes, ultimately, this results in selectable phenotypes. Selectable phenotypes can result in a gain or a loss in fitness by natural selection.

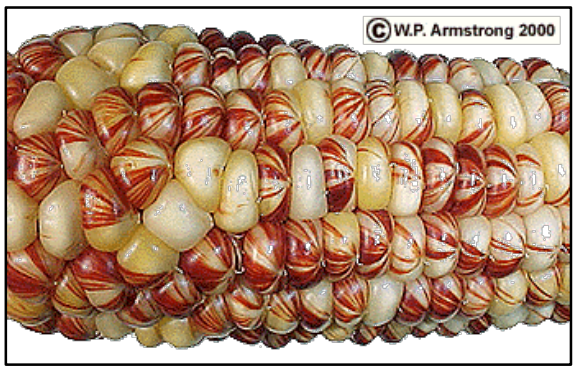
Put simply, transposons move, manipulate, and alter genetic information within organisms leading to the development of new diversity and novel genes.



Mechanism of DNA Transposon



Mechanism of Retrotransposon



This picture is a model example of transposons inserting into pigment regions within the maize genome cause color alterations within kernels.

Literature:

Slotkin, R. Keith, and Robert Martienssen. "Transposable elements and the epigenetic regulation of the genome." *Nature Reviews Genetics* 8.4 (2007): 272-285.

Bao, Jianqiang, and Wei Yan. "Male germline control of transposable elements." *Biology of reproduction* 86.5 (2012): 162.

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