

Transposable elements and an epigenetic basis for punctuated equilibria.

Bioessays. 2009 Jul;31(7):715-26

Authors: Zeh DW, Zeh JA, Ishida Y

Evolution is frequently concentrated in bursts of rapid morphological change and speciation followed by long-term stasis. We propose that this pattern of punctuated equilibria results from an evolutionary tug-of-war between host genomes and transposable elements (TEs) mediated through the epigenome. According to this hypothesis, epigenetic regulatory mechanisms (RNA interference, DNA methylation and histone modifications) maintain stasis by suppressing TE mobilization.

However, physiological stress, induced by climate change or invasion of new habitats, disrupts epigenetic regulation and unleashes TEs. With their capacity to drive non-adaptive host evolution, mobilized TEs can restructure the genome and displace populations from adaptive peaks, thus providing an escape from stasis and generating genetic innovations required for rapid diversification. This "epi-transposon hypothesis" can not only explain macroevolutionary tempo and mode, but may also resolve other long-standing controversies, such as Wright's shifting balance theory, Mayr's peripheral isolates model, and McClintock's view of genome restructuring as an adaptive response to challenge.

<http://science.journalfeeds.com/biology/bioessays/transposable-elements-and-an-epigenetic-basis-for-punctuated-equilibria/20100119/>