

Invited Talk

The Third Rebuttal of the Random Breakage Theory

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Abstract

Rearrangements are genomic "earthquakes" that change the chromosomal architectures. The fundamental question in molecular evolution is whether there exist "chromosomal faults" where rearrangements are happening over and over again. In 1984 Nadeau and Taylor proposed the Random Breakage Model (RBM) of chromosome evolution that recently caused a controversy. RBM postulates that rearrangements are "random", and thus there is no rearrangement hot-spots in mammalian genomes. It became the de facto theory of chromosome evolution (due to its prophetic prediction power) but in 2003 was refuted by Pevzner and Tesler who gave a non-constructive argument against RBM using a combinatorial theorem. They further proposed the Fragile Breakage Model that postulates that mammalian genomes represent a mosaic of fragile and solid regions. However, the rebuttal of RBM caused a controversy and shortly after Pevzner-Tesler work was published, Sankoff and Trinh, 2004 gave a rebuttal of the rebuttal of RBM. Recently, Peng et al., 2006 re-examined the Sankoff-Trinh's arguments and demonstrated that they fell victims to their inaccurate synteny block generation algorithm. Sankoff, 2006 recently acknowledged the flaw in Sankoff and Trinh, 2004 but argued that a larger set of rearrangement operations (e.g., transpositions) may explain the "fragile regions" phenomenon and that the "block deletion" argument in Sankoff and Trinh, 2004 is still valid. In this talk we give a rebuttal of the rebuttal (Sankoff, 2006) of the rebuttal (Peng et al., 2006) of the rebuttal (Sankoff and Trinh, 2004) of the rebuttal (Pevzner and Tesler, 2003) of RBM. We further describe the evidence from recent biological studies pointing to the specific fragile regions in the human genome.