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Modelling the proliferation of transposons in the presence of environmental stress

Transposable elements (TEs) are DNA segments capable of changing their positions in the genome. Until recently, they have been considered to be selfish, parasitic DNA. As of late, however, they have been acknownledged to be a major driving force of genome evolution. The dynamics of TE proliferation in living organisms is not understood well. It is usually modelled with the assumption of so-called 'transposition-selection equilibrium' (TSE) a balance between the TE's selfish drive to multiply inside the host, increasing their numbers, and the deleterious influence of high TE copy number on the host, causing selective pressure against hosts with high TE counts. TSE models, however, fail to adequately explain certain behaviours observed in nature, such as explosive bursts of TE activity, dramatically varied TE counts between closely-related species, and increase of TE counts in domesticated variants of plants. I will present a non TSE-based, stochastic model of TE amplification that takes into account the stress exerted on host organisms by changing environment. Using this model, I will show how the various dynamics observed in nature (and not in TSE models) can be explained to be a result of interaction between environmental pressure, the organism's phenotype, and TE-driven adaptation.