Abstract Submitted
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Control of DNA replication by anomalous reaction-diffusion kinetics[1] MICHEL GAUTHIER, JOHN BECHHOEFER, Simon Fraser University — DNA replication requires two distinct processes: the initiation of pre-licensed replication origins and the propagation of replication forks away from the fired origins. Experiments indicate that these origins are triggered over the whole genome at a rate $I(t)$ (the number of initiations per unreplicated length per time) that increases throughout most of the synthesis (S) phase, before rapidly decreasing to zero at the end of the replication process. We propose a simple model for the control of DNA replication in which the rate of initiation of replication origins is controlled by the interaction with a population of rate-limiting proteins. We find the time set by reaction-diffusion kinetics for such proteins to find, bind to, and trigger a potential origin. Analyzing data from *Xenopus* frog embryos, we find that the initiation rate is reaction limited until nearly the end of replication, when it becomes diffusion limited. Initiation of origins and hence $I(t)$ is suppressed when the diffusion-limited search time dominates. We find that, in order to fit the experimental data, the interaction between DNA and the rate-limiting protein must be subdiffusive.

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