

Comparison Between Effective and Individual Growth Rates in a Heterogeneous Population

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In various experiments, biologists have observed significant variability in the way cells grow. In this talk, we consider cellular populations evolving by growth and division, and investigate how cell-to-cell variability in growth rates affects overall population growth. Does a highly heterogeneous population grow asymptotically faster than a homogeneous one? For a given heterogeneous population, what growth rate—which we define as the effective rate—should the cells of a homogeneous population share in order for it to achieve the same asymptotic growth? Does this depend on how growth rates are inherited? We qualitatively and quantitatively address these questions using a growth-fragmentation equation, structured in cell size and growth rate, with specific but biologically relevant coefficients. This allows us to explore the complex and crossed influence of heterogeneity and heredity on the selection dynamics at play, and revisit the question : Is variability beneficial to population growth?

- [1] M. Doumic, A. Rat, M. Tournus. *Comparison between effective and individual fitness in a heterogeneous population*. doi :10.48550/arXiv.2501.05751.

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