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Phenotypic variability of growing cellular populations TING LU, Princeton University, TONGYE SHEN, Los Alamos National Lab, MATTHEW BENNETT, PETER WOLYNES, JEFF HASTY, UCSD — The dynamics and diversity of proliferating cellular populations are governed by the interplay between the growth and death rates among the various phenotypes within a colony. In addition, epigenetic multistability can cause cells to spontaneously switch from one phenotype to another. By examining a generalized form of the relative variance of populations and classifying it into intracolony and cross-colony contributions, we study the origins and consequences of cellular population variability. We find that the variability can depend highly on the initial conditions and the constraints placed on the population by the growth environment. We construct a two-phenotype model system and examine, analytically and numerically, its time-dependent variability in both unbounded and population-limited growth environments. We find that in unbounded growth environments the overall variability is strictly governed by the initial conditions. In contrast, when the overall population is limited by the environment, the system eventually relaxes to a unique fixed point regardless of the initial conditions. However, the transient decay to the fixed point depends highly on initial conditions, and the time scale over which the variability decays can be very long, depending on the intrinsic time scales of the system.

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