

Changes in phenotypic variability during an evolutionary transition

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Abstract:

Phenotypic variation is central to evolution, and understanding the causes and consequences of differences in the propensity to vary (variability) is considered one of the central problems in biology. While variability has been observed across hierarchical levels of organization, studies have only begun to understand how patterns of variability change across these levels during a major evolutionary transition. We use the volvocine green algae to examine how variability changes during the evolution of complex multicellularity, from simple, undifferentiated species composed of a less than a dozen cells to larger species with thousands of cells and two fully differentiated cell types. We counted reproductive cells in individual colonies and quantified cell number variability in seven species and one cellular differentiation mutant in standard growing conditions and under nutrient deprivation. We find that fully differentiated multicellular species exhibit less phenotypic variability than their smaller, undifferentiated counterparts. This indicates that the production and regulation of variability has likely changed in the volvocine green algae during a major transition in evolution.