

Abstract Submitted
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Synthetic Yeast Cooperation WENYING SHOU, JUSTIN BURTON,
Fred Hutchinson Cancer Research Center — Cooperation is wide-spread and has been postulated to drive major transitions in evolution. However, Darwinian selection favors “cheaters” that consume benefits without paying a fair cost. How did cooperation evolve against the threat of cheaters? To investigate the evolutionary trajectories of cooperation, we created a genetically tractable system that can be observed as it evolves from inception. The system consists of two engineered yeast strains – a red-fluorescent strain that requires adenine and releases lysine and a yellow-fluorescent strain that requires lysine and releases adenine. Cells that consume but not supply metabolites would be cheaters. From the properties of two cooperating strains, we calculated and experimentally verified the minimal initial cell densities required for the viability of the cooperative system in the absence of exogenously added adenine and lysine. Strikingly, evolved cooperative systems were viable at 100-fold lower initial cell densities than their ancestors. We are investigating the nature and diversity of pro-cooperation changes, the dynamics of cooperator-cheater cocultures, and the effects of spatial environment on cooperation and cheating.

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