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Exploring evolutionary trajectories of populations subjected to sequences of drugs in vitro

Antibiotic resistance is a burden on human health. Drug sequences have previously been explored as way to thwart drug resistance in a population. Furthermore, our lab has previously shown that given perfect knowledge of an organisms fitness landscape, drug sequences can be used to steer an organism toward or away genotypes that confer resistance. We will build an automatic culturing device that delivers drugged media to a liquid culture of bacteria depending on its growth rate as monitored by optical density via a microcontroller. In this way, the population can be constantly challenged to resistance against a drug, and then another drug, and so on, in sequence. By collecting real time growth and genotypic data we aim to investigate the effect of drug sequences on evolution, specifically the non-commutativity of drug sequences with respect to the resulting fitness of the population, as well as the divergence of evolutionary trajectories as modulated by different drug sequences.