

Abstract Submitted
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Complex dynamics of selection and cellular memory in adaptation to a changing environment¹ EDO KUSSELL, WEI-HSIANG LIN, New York University — We study a synthetic evolutionary system in bacteria in which an antibiotic resistance gene is controlled by a stochastic on/off switching promoter. At the population level, this system displays all the basic ingredients for evolutionary selection, including diversity, fitness differences, and heritability. At the single cell level, physiological processes can modulate the ability of selection to act. We expose the stochastic switching strains to pulses of antibiotics of different durations in periodically changing environments using microfluidics. Small populations are tracked over a large number of periods at single cell resolution, allowing the visualization and quantification of selective sweeps and counter-sweeps at the population level, as well as detailed single cell analysis. A simple model is introduced to predict long-term population growth rates from single cell measurements, and reveals unexpected aspects of population dynamics, including cellular memory that acts on a fast timescale to modulate growth rates.

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